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Twenty-Eighth Annual Report

OF THE

Illinois State Beekeepers' Association

THIRTY-EIGHTH YEAR OF ASSOCIATION

Organized February 26, 1891, at

Springfield, Illinois

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Compiled by

V. G. MILUM

Champaign, Illinois

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LETTER OF TRANSMITTAL

OFFICE OF THE SECRETARY,
CHAMPAIGN, ILLINOIS, *April 25, 1929.*

To His Excellency, LOUIS L. EMMERSON, *Governor of the State of Illinois:*

Sir: I have the honor to transmit herewith the Twenty-eighth Annual Report for the thirty-eighth year of the Illinois State Beekeepers' Association.

V. G. MILUM, *Secretary.*

JEFFERSONS PRINTING & STATIONERY CO.
SPRINGFIELD, ILLINOIS
1929

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TWENTY-EIGHTH ANNUAL REPORT
FOR THE THIRTY-EIGHTH YEAR
OF THE

Illinois State Beekeepers Association

1928

OFFICERS OF THE ILLINOIS STATE BEEKEEPERS' ASSOCIATION FOR 1928

DR. A. C. BAXTER - - - - - - - President
Springfield

A. L. KILDOW - - - - - Inspector of Apiaries
Putman

E. A. JOHNSON - - - - - - Vice-President
Peoria

C. A. MACKELDEN - - - - - Vice-President
Jerseyville

E. A. MEINEKE - - - - - Vice-President
Arlington Heights

TOM BENTON - - - - - - Vice-President
Johnston City

EMORY WARNER - - - - - Vice-President
Monticello

ELMER KOMMER - - - - - - Treasurer
Woodhull

V. G. MILUM - - - - - - - Secretary
Vivarium Bldg., Champaign

List of members and index in back of report

OFFICERS OF ILLINOIS STATE BEEKEEPERS' ASSOCIATION FOR 1929

DR. A. C. BAXTER - - - - - - President
Springfield

C. A. MACKELDEN - - - - - Vice-President
Jerseyville

EDWARD C. HELDT - - - - - Vice-President
Stanford

EMORY WARNER - - - - - Vice-President
Monticello

EDWIN PETERSON - - - - - Vice-President
Kewanee

A. G. GILL - - - - - - Vice-President
Chicago

ELMER KOMMER - - - - - - Treasurer
Woodhull

V. G. MILUM - - - - - - - Secretary
Vivarium Bldg., Champaign

A. L. KILDOW - - - - - Inspector of Apiaries
Putman

MINUTES OF THE THIRTY-EIGHTH ANNUAL CONVENTION OF THE ILLINOIS STATE BEEKEEPERS' ASSOCIATION—SPRINGFIELD, ILLINOIS, DECEMBER 6-7, 1928

(Preceding the regular convention, the deputy apiary inspectors met at the call of Chief Inspector, A. L. Kildow, for a school of instruction on the evening of December 5. Methods of inspection, treatment of disease, and plans for the inspection work of 1929 were discussed.)

The regular convention in the parlors of the St. Nicholas Hotel at Springfield was called to order at 9:30 a. m., December 6, 1928, by President Baxter, of Springfield, with about fifty beekeepers in attendance. At the suggestion of the President, the reading of the minutes of the last meeting was dispensed with and upon motion were accepted as published in the printed Twenty-seventh Annual Report of the Association. Following this President Baxter gave a short address in which he pointed out that with the large number of beekeepers in the State of Illinois too few are members of our Association. He stressed the fact that with a larger membership a greater program of co-operation could be developed for the benefit of the beekeeping industry.

The following committees were appointed by President Baxter:

Auditing Committee:—Roy Roselieb, Prophetstown, and Edward C. Heldt, Stanford; Resolutions:—C. A. Mackelden, Jerseyville, and S. A. Tyler, San Jose; Banquet:—Edwin Kommer, Woodhull, and W. H. Force, Champaign; Question Box:—Benj. Fischer, Roanoke.

The general report of the secretary was read and on motion was accepted as read. The financial reports of the secretary and treasurer were read by V. G. Milum, Champaign, and Elmer Kommer, Woodhull, respectively, and on motion were referred to the auditing committee. These reports were approved by the auditing committee and their report accepted at the final business session on December 7. These financial reports showed a balance on hand at the 1927 Annual Convention of $264.95 with receipts for memberships during the year of $318.50, making a total for the year of $583.45. With expenditures during the past year of $277.60, there remained on hand at the 1928 Annual Convention a balance of $305.85, showing a net gain of $40.90 over the balance at the time of the 1927 convention.

The report of the State Inspector of Apiaries was read by A. L. Kildow, of Putman. This report was for the year ending June 30, 1928, and showed a total of 6950 apiaries visited with 82379 colonies. Of these 4210 colonies were found diseased and 1592 were destroyed, while 825 were treated by the inspectors. With the remaining dis-

eased colonies the owners were allowed to treat by following out the instructions of the inspectors.

Following this business meeting, the regular planned program of speaking was carried out with the exception of the subjects by Mr. E. W. Atkins of Watertown, Wisconsin. Mr. Atkins was ill at the time and was unable to attend.

The first speaker was Mr. M. D. Farrar, of the State Natural History Survey, Urbana, who spoke upon the subject, "Weighing Bees for Profit." Following this Mr. H. C. Dadant discussed the question "Saving the Beeswax." (Their discussions as well as that of the other speakers on the convention program are included in the 28th Annual Report of the Association in which these minutes are printed.)

Following the lunch hour an interesting program was given with H. H. Root of Medina, Ohio, speaking upon the "Color, Flavor, and Clarity of Honey"; Dr. H. E. Barnard, President of the American Honey Institute, Indianapolis, on the "Aims and Purposes of the American Honey Institute," and Professor P. H. Tracy, of the Dairy Manufacturing Department of the University of Illinois, discussing a "Study of the Use of Honey in the Manufacture of Ice Cream." Following this a number of interesting questions were discussed under the leadership of Benjamin Fischer.

The second annual banquet of the association was held at the St. Nicholas Hotel starting at 6:30 p. m. on the evening of the first day of the convention. After the usual banquet courses, a resolution was presented and passed, conferring honorary membership on Dr. A. C. Baxter and Mr. A. L. Kildow. Following this a number of persons, including the speakers, were introduced by the toastmaster, Mr. C. A. Mackelden. Mr Huber Root, the last speaker on the banquet program, gave those present some real advice.

Assembling at 8:15 p. m., those present listened to a discussion by Edwin Peterson, of Kewanee, on "A Visit to the A. I. Root Company of Medina, Ohio." Following this, each person present was allowed to give a two minute discussion of any subject that he chose. The majority of the beekeepers present chose to talk upon the subject of "Wintering."

The regular business meeting of the association was called to order by President Baxter at 9:00 a. m. on Friday, December 7. Following the report of the auditing committee, which was accepted as previously mentioned, a number of resolutions were submitted by the resolutions committee, all of which were adopted as read.

The officers elected unanimously with no other nominations for the respective offices being made were as follows: President, Dr. A. C. Baxter, Springfield; Vice-President, C. A. Mackelden, Jerseyville, Edward C. Heldt, Stanford, Emory Warner, Monticello, Edwin Peterson, Kewanee, A. G. Gill, Chicago; Treasurer, Elmer Kommer, Woodhull; Secretary, V. G. Milum, Champaign. Mr.

James A. Stone of Farmingdale, Illinois, a charter member of the Association, claimed the honor of nominating Dr. Baxter for President, and expressed the hope that he might be able to do so as long as Dr. Baxter would accept the office. C. A. Mackelden and Emory Warner were re-elected as vice-presidents, while the 1927 president, treasurer and secretary were retained for another year.

The association adopted the following amendment to the constitution:

Amendment to Section 1, Article 3, Constitution of the State Beekeepers' Association to read as follows: Any person interested in apiculture may become a member upon payment to the secretary an annual fee of One Dollar ($1.00), not including a subscription to a bee journal. And any affiliating association as a body may become members on payment of an aggregate fee of fifty cents ($.50) per member.

The question of what is an association for the purpose of affiliating members at the 50 cent rate, was discussed but the final decision was left to the executive committee.

Following the final business meeting, Mr. C. Swanson, Hamilton, Illinois, discussed "Preparing Honey for Market," and Mr. H. H. Root, Medina, Ohio, spoke on "What About Honey Now?"

The meeting adjourned at 11:30 a. m., December 7, 1928.

V. G. MILUM, *Secretary.*

RESOLUTIONS APPROVED AND ADOPTED AT THIRTY-EIGHTH ANNUAL CONVENTION, DECEMBER 6-7, 1928

BE IT RESOLVED, That the Illinois State Beekeepers' Association in its 38th Annual Convention assembled, at Springfield, Illinois, December 6-7, 1928, hereby approve and adopt the following Resolutions and that a copy be spread upon its books and copies sent to the various appropriate authorities concerned.

1. WHEREAS, In the past history of the Illinois State Beekeepers' Association, it has been customary to confer honorary membership on certain of its members who have rendered long and faithful service in behalf of the Association, and

WHEREAS, there are now certain persons who have given faithful service to the Illinois Beekeepers' Association for many years who previously have not been so honored,

BE IT RESOLVED, that this Association in recognition of their services confer honorary membership upon Dr. A. C. Baxter of Springfield and Mr. A. L. Kildow, Chief Inspector of Apiaries, Putman, Illinois.

2. BE IT RESOLVED, that all hives and appurtenances shall be equipped with removable frames, which will lessen the cost of inspection.

3. BE IT RESOLVED, that the Bureau of Entomology be urged to put forth a strong effort to determine the origin of the various bacteria or other organisms that affect the honey bee.

4. BE IT RESOLVED, that we have more rigid enforcement of the laws pertaining to the shipment of bees on combs into the State of Illinois.

(Resolutions Nos. 2, 3 and 4 were submitted by a committee representing the Deputy Inspectors, assembled in school of instruction at the St. Nicholas Hotel, Springfield, December 5, 1928. This committee consisted of C. A. Mackelden, J. R. Wooldridge, and W. H. Snyder.)

5. WHEREAS, the information now furnished by the Bureau of Census regarding the number of colonies of bees owned and pounds of honey produced per colony is entirely inaccurate due to the fact that the census blanks do not include the enumeration of bees owned by persons living in villages and cities, and whereas there is constant demand and use for correct information on the total ownership of bees and production of honey.

BE IT RESOLVED, that this association again urge the Bureau of Census to have the census blanks for 1930 include such spaces for

the recording of bees owned in villages and cities, as well as on farms.

6. WHEREAS, the Bureau of Agricultural Economics now reports at frequent intervals the origin and destination of some 30 commodities which are shipped in carlots, and whereas if this same information on honey were available there would be less doubt as to where honey is being produced and where it is being used,

BE IT RESOLVED, that the Illinois State Beekeepers' Association urge the Bureau of Agricultural Economics to include honey in its reports of carlot shipment of commodities.

7. WHEREAS, an amendment to the federal highway act provides that specifications for federal aid projects hereafter may include planting and maintenance of shade trees for the purpose of beautifying the highways, and

WHEREAS, there are many trees such as linden, tulip-tree, hard maple, and others which yield nectar and pollen freely which would be of a distinct economic value in the building up of colony strength and in the production of honey, while at the same time enhancing the beauty of such highways,

BE IT RESOLVED, that the Illinois State Beekeepers' Association urge the inclusion of trees of this type in the federal road tree-planting projects, except that shade trees are not to be planted along or bordering cultivated fields, and that the proper federal authorities pass this information on to the appropriate construction and maintenance units.

8. WHEREAS, the Corn Sugar interests have in the past few years made several attempts to secure the passage of laws allowing the use of corn sugar for sweetening purposes without so stating on the label of the package or container, and

WHEREAS, the passage of such a law would destroy the confidence of the consuming public in many desirable food articles and would tend to undermine the Pure Food and Drug Act paving the way for other types of adulteration, and

WHEREAS, such a law would not make corn sugar more available to the housewife as claimed by its previous sponsors, nor increase the price of corn for the producer or farmer according to an opinion of the Secretary of Agriculture, and

WHEREAS, the corn sugar interests in 1928 used various means such as transferring the hearings from one committee to another in Congress and claiming the support of the Farm Bureau and the National Grange which organizations had not passed resolutions favoring the law, therefore,

BE IT RESOLVED, that the Illinois State Beekeepers' Association go on record as opposing any such legislation as proposed by the bills introduced into Congress as Senate bill 2806 and House bill H. R. 10022, under date of January 25, 1928, or any amendments

thereto which may later encourage the breaking down of the Food and Drug Act of 1906, and furthermore,

BE IT RESOLVED, that this association authorize its acting secretary at such time as may be necessary to transmit copies of this resolution signed by the executive committee to the proper representatives in Congress and such other important officials and committees in Congress as may have such bills before them for consideration.

Further, BE IT ROSOLVED, that all local associations be asked to make urgent and convincing protest to the proper authorities at such time as is deemed necessary when notified by the bee journals or through the office of the secretary of this association.

WHEREAS, Dr. E. F. Phillips and representatives of the bee journals were especially active in tracing these bills through the last Congress,

BE IT RESOLVED, that this association extend to these dutiful sentinels a vote of appreciation and thanks for the services rendered in protecting our industry from this unsound legislation.

9. WHEREAS, the proper grading of honey and other products is the only sound basis for fixing prices in the markets, and whereas properly graded products establish confidence which leads to the establishment of quality prices, and

WHEREAS, there is in existence a workable set of rules for grading and packing of honey recommended by the Department of Agriculture which already have been adopted by other states;

BE IT RESOLVED, that the Illinois State Beekeepers Association recommend to Illinois beekeepers the adoption and use of these rules as set forth in Circular No. 24, U. S. Department of Agriculture, subject to such changes as their future use may find necessary, and that the secretary take such steps as are deemed advisable to acquaint the beekeeper with these rules.

10. WHEREAS, the Bee Culture Laboratories of the U. S. Bureau of Entomology have been of great service to the beekeepers of the State of Illinois in the constant studies and investigations of beekeeping problems, therefore

BE IT RESOLVED, that the Illinois State Beekeepers' Association extend to that office and its personel a vote of confidence with hopes for continuance of this service with possibilities offered for greater expansion of its activities in the future especially along the lines of investigations relative to the marketing of honey and to its characteristics and its possible uses.

11. WHEREAS, the recently organized American Honey Institute with Dr. H. E. Barnard as its President is attempting a worth while service in its program of education for honey and its uses which we believe will greatly increase the consumption of honey, thereby benefiting the beekeepers;

BE IT RESOLVED, that the Illinois State Beekeepers' Association pledge its support to this organization and commend its activities with a hope that they may be continuous.

12. WHEREAS, certain investigations relative to the use of honey for sweetening purposes in the manufacture of ice cream recently conducted by the Department of Dairy Manufacturing of the University of Illinois have given excellent results and show promise of a greater utilization of honey in the manufacture of dairy and other products, therefore,

BE IT RESOLVED, that the Illinois State Beekeepers' Association heartily commend the University Dairy Manufacturing Department and especially Professor P. H. Tracy for their endeavors in this investigation, hoping that some means may be obtained whereby further studies may be continued along the same and other lines looking toward the greater use of honey in the manufacture of dairy and other articles of food.

13. BE IT RESOLVED, that the members of the Illinois State Beekeepers' Association use their influence with their respective Senators and Representatives relative to the Budget System as prepared by our Chief Inspector, A. L. Kildow.

14. BE IT RESOLVED, that we, the members of the Illinois State Beekeepers' Association, recommend to our new Governor, Mr. Louis L. Emmerson, our esteemed Chief Inspector, A. L. Kildow, for reappointment.

15. BE IT RESOLVED, that a vote of thanks be extended authorities of the St. Nicholas Hotel, for their continued courtesy and cooperation in allowing the use of the hotel parlors for our meetings and other services rendered.

16. BE IT RESOLVED, that this association hereby extend a vote of thanks to all those who have taken part in its meetings, contributing of their time and efforts to make it a successful convention.

17. BE IT RESOLVED, that this association hereby vote thanks to its officers for their conscientious, faithful service during the past year.

(Signed) C. A. MACKELDEN,
S. A. TYLER,
Resolution Committee.

REPORT OF THE TREASURER FOR 1928

Woodhull, Illinois, December 5, 1928.

To the Illinois State Beekeepers' Association—GREETINGS.

I herewith make my Third Annual Report as Treasurer of the Illinois State Beekeepers' Association, subject to your approval.

RECEIPTS

	No.	
Balance on hand at last convention		$264.95
January 5—Received from V. G. Milum, Sec'y.	(1)	11.25
January 5—Received from V. G. Milum, Sec'y.	(2)	11.00
January 14—Received from G. H. Cale, Former Sec'y.	(3)	29.75
January 23—Received from V. G. Milum, Sec'y.	(4)	5.50
January 23—Received from V. G. Milum, Sec'y.	(5)	3.50
February 16—Received from V. G. Milum, Sec'y.	(6)	2.00
February 16—Received from V. G. Milum, Sec'y.	(7)	1.00
January 31—Received from E. A. Swanson, Treas., Henry Co.	(8)	9.50
February 16—Received from V. G. Milum, Sec'y.	(9)	9.00
February 18—Received from V. G. Milum, Sec'y.	(10)	16.50
February 29—Received from V. G. Milum, Sec'y.	(11)	4.00
February 29—Received from V. G. Milum, Sec'y.	(12)	8.00
February 29—Received from V. G. Milum, Sec'y.	(13)	4.00
February 29—Received from A. E. Swanson, Treas., Henry Co.	(14)	3.00
March 30—Received from V. G. Milum, Sec'y.	(15)	22.00
April 4—Received from V. G. Milum, Sec'y.	(16)	6.50
April 30—Received from V. G. Milum, Sec'y.	(17)	31.00
April 30—Received from V. G. Milum, Sec'y.	(18)	3.50
May 4—Received from A. E. Swanson, Treas., Henry Co.	(19)	2.00
June 6—Received from V. G. Milum, Sec'y.	(20)	26.75
June 6—Received from V. G. Milum, Sec'y.	(21)	22.75
June 23—Received from A. E. Swanson, Treas., Henry Co.	(22)	5.00
July 5—Received from V. G. Milum, Sec'y.	(23)	11.25
September 1—Received from V. G. Milum, Sec'y.	(24)	29.00
October 16—Received from V. G. Milum, Sec'y.	(25)	18.50
November 3—Received from Fred Meinen, Sec'y., Baileyville	(27)	6.00
November 30—Received from V. G. Milum, Sec'y.	(26)	16.25
Total receipts		$583.45

EXPENDITURES

January 27—Elmer Kommer, Expense Meeting Dec., 1927	$ 21.25
February 6—M. G. Dadant, for banquet tickets, etc	10.65
May 30—V. G. Milum, 3 months' salary	50.00
April 10—Elmer Kommer, Expense Executive Meeting	20.16
April 10—V. G. Milum, Expense Executive Meeting	7.93
June 5—V. G. Milum, 3 months' salary	50.00
September 17—V. G. Milum, 3 months' salary	50.00
November 8—Elmer Kommer, Expense Executive Meeting	13.56
November 8—V. G. Milum, Expense Executive Meeting	3.80
November 20—V. G. Milum, 3 months' salary	50.00
Total Expenses during term	$277.60

Recapitulation:

Total Receipts	$583.45
Total Expenditures	277.60
Balance on hand	$305.85

(Signed) Elmer Kommer,
Treasurer, Illinois State Beekeepers' Ass'n.

December 7, 1928.

We, the auditing committee, have examined these records and have found them correct.

(Signed) Edward C. Heldt,
Roy Roselieb,
(*Auditing Committee*)

FINANCIAL REPORT OF THE SECRETARY FOR PERIOD BEGINNING DECEMBER 7, 1927, AND ENDING DECEMBER 6, 1928.

RECEIPTS.

Balance in Treasury at last convention, December 6, 1927 ..... $264.95

Received by Secretary and transmitted to Treasurer or received by Treasurer direct according to the following Membership Dues Receipt Numbers:

Receipt No.	Date received by Treasurer	Description	Amount received by Secretary	Remitted for Bee Journals	Remitted to Treas.
No. 1	January 5	M. G. Dadant, collected at convention	$ 17.00	$5.75	$11.25
No. 2	January 5	Peoria County	11.00		11.00
No. 3	January 14	G. H. Cale	(29.75 to Treasurer)		29.75
No. 4	January 23	Piatt County	5.50		5.50
No. 5	January 23	Cook County	3.50		3.50
No. 6	February 16	Woodford County	2.00		2.00
No. 7	February 16	DeKalb County	1.00		1.00
No. 8	January 31	Henry County	(9.50 to Treasurer)		9.50
No. 9	February 16	Stephenson County	5.00		
		Grundy County	3.50		
		Whiteside County	.50		9.00
No. 10	February 18	Cook County	16.50		16.50
No. 11	February 29	DeKalb County	4.00		4.00
No. 12	February 29	Iroquois County	8.00		8.00
No. 13	February 29	Hancock County	4.00		4.00
No. 14	February 29	Henry County	(3.00 to Treasurer)		3.00
No. 15	March 30	Members at large	20.75	5.00	
		Grundy County	.75		
		Woodford County	1.50		
		McHenry County	4.00		
			$ 27.00	$5.00	22.00
No. 16	April 4	Cook-DuPage	6.50		6.50
No. 17	April 30	Piatt County	3.50		
		Woodford County	.50		
		Montgomery County	6.00		
		Kane County	2.00		
		Shelby County	8.50		
		Hancock County	4.00		
		Champaign County	3.00		
		Members at large	5.25	1.75	
			$ 32.75	$1.75	31.00
No. 18	April 30	Williamson County	3.50		3.50
No. 19	May 4	Henry County	(2.00 to Treasurer)		2.00
No. 20	June 6	Members at large	12.25	3.50	
		LaSalle County	.50		
		Champaign County	.50		
		Mercer County	2.50		
		Kane	1.50		
		McLean	3.00		
		DeKalb	4.00	1.50	

Receipt No.	Date received by Treasurer	Description	Amount received by Secretary	Remitted for Bee Journals	Remitted to Treas.
		McHenry	3.50		
		Cook	.50		
		Woodford	1.00		
		Whiteside	2.50		
			$ 31.75	$5.00	26.75
No 21	June 6	Rock Island	5.50		
		Kane	1.00		
		Williamson	1.50		
		Grundy	.75		
		Jo Davies	7.00		
		Ogle	3.00		
		Shelby	1.50		
		Cook-DuPage	2.50		
			$ 22.75		22.75
No. 22	June 23	Henry County	4.50		
		Warren County	.50		
			(5.00 to Treasurer)		5.00
No. 23	July 5	Members at large	8.00	2.25	
		Woodford County	1.50		
		Kane County	1.00		
		DeKalb County	.50		
		Piatt County	2.00		
		Hancock County	.50		
			$ 13.50	2.25	11.25
No. 24	September 1	Fulton County	7.00		
		Kane	1.00		
		Jefferson	7.50		
		Woodford	.50		
		Saline-Galatin	6.00		
		Whiteside	2.00		
		Will	5.00		
			$ 29.00		29.00
No. 25	October 16	Members at large	3.00	.50	
		JoDavies County	.50		
		Cook-DuPage	7.50		
		Mercer	5.50		
		Lee-Ogle	2.50		
			$ 19.00	.50	18.50
No. 27	October 29	Northwest Independent	(6.00 to Treasurer)		6.00
No. 26	November 27	Members at large	13.25	3.50	
		Franklin County	1.50		
		Woodford County	1.50		
		Christian County	1.00		
		Cook-DuPage	1.50		
		Shelby County	.50		
		McHenry	.50		
			$ 19.75	3.50	16.25

Totals received by Secretary and Treasurer	$342.25	
Remitted by Secretary for bee journals	23.75	
Total Received by or remitted to Treasurer	$318.50	$318.50
Balance on hand December 6, 7, 1928		264.95
Total receipts for year ending December 6, 1928		$583.45

EXPENDITURES

From December 6, 1927, to December 6, 1928, by Vouchers as follows:

No. 1	January 19—Elmer Kommer, Expenses to annual meeting, Dec. 6, 7, 1927	$ 21.50
No. 2	February 1—M. G. Dadant, Banquet tickets for speakers and supplies for Mrs. Cornforth's lecture	10.65
No. 3	March 30—V. G. Milum, 3 months' salary	50.00
No. 4	April 4—Elmer Kommer, Expenses to Executive meeting at Springfield on March 30	20.16
No. 5	April 4—V. G. Milum, Expenses to Executive meeting at Springfield on March 30	7.93
No. 6	May 31—V. G. Milum, 3 months' salary	50.00
No. 7	September 10—V. G. Milum, 3 months' salary	50.00
No. 8	November 6—Elmer Kommer, Expenses to Executive meeting at Bloomington on November 1	13.56
No. 9	November 6—V. G. Milum, Expenses to Executive meeting at Bloomington on November 1	3.80
No. 10	November 6—V. G. Milum, 3 months' salary	50.00
	Total vouchered from association treasury	$277.60

Recapitulation:

Total receipts	$583.45
Total expenditures	277.60
Balance on hand Dec. 6, 1928	305.85
Balance at 1927 Annual Convention	264.95
Net gain over balance one year ago	$ 40.90

(Signed) V. G. Milum,
Secretary Illinois State Beekeepers' Ass'n.

December 7, 1928.

We, the auditing committee, have examined the records of the Secretary and the Treasurer of the Illinois State Beekeeprs' Association and find them correct.

(Signed) Edward C. Heldt,
Roy Roselieb,
Auditing Committee.

GENERAL REPORT OF THE SECRETARY FOR PERIOD BEGINNING DECEMBER 7, 1927, AND ENDING DECEMBER 6, 1928.

(V. G. Milum, Champaign, Illinois)

At the conclusion of one year of service as the secretary of your association I must say that I have enjoyed the work and I hope that the duties have been fulfilled to your satisfaction. To one not acquainted with the work, the enormous amount of details at first seemed stupendous and, no doubt, a large amount of time was wasted in mastering these details. During the last few months this difficulty has been relieved considerably and much of the work turned over to a stenographer.

One of my first acts upon taking office was to check up as much as possible upon the membership records and mailing addresses of each of our members from the previous correspondence in order to eliminate complaints of members who did not receive the monthly bulletin or the annual report. Probably most of these are now correct with a few exceptions in which the local secretary refused or ignored several letters of inquiry on my part.

The local association secretaries are aware of the fact that early in the year I sent them a general letter of information at the same time asking for cooperation along certain lines, especially as to the scheduling of meetings in a series in order to conserve the time and energy of the speaker and reduce the expenses. Furthermore it was hoped that more and better speakers could thus be obtained for the local meetings. Only a few secretaries returned these blanks, probably because of lack of definite information at the time. Your secretary still believes that the principle was correct but perhaps the method of securing the cooperation was not right.

In the above mentioned letter a blank was enclosed for supplying us a list of old members and their addresses. Only a few of these were returned. However, during the year these were rather consistently used by the secretaries in sending in the new affiliation fees. Further cooperation of the local secretaries would greatly facilitate the keeping of the state association records. Often the names of persons for whom an affiliation fee is sent are included in the middle of a paragraph in a letter. In this way they may be easily overlooked, and at the same time are hard to file away properly, since a part of the letter may want to be saved for inclusion as a news item in the monthly bulletin.

An attempt has been made to acknowledge each receipt of dues from local secretaries for the group of their affiliated members and for each beekeeper whose dues for membership at large have been

received. As each separate dues is received, the beekeeper's card must be located in either the paid-up or un-paid file or if a new member a new card made out, the date of payment recorded, and the original list from the secretary checked. If the envelopes for the next issue of the monthly bulletin have been addressed, then an envelope must be addressed and proper disposal made of it. It has been the practice during the past year to send a number of the back issues of the bulletin to each new member.

Membership Dues

Concerning the membership dues at large there has been some confusion and misunderstanding regarding the amount of dues to be paid. It is my understanding that the amount of $1.75 was originally established for the express purpose of getting a bee journal into the hands of every beekeeper. Under our present system, members of local associations are affiliated for the sum of 50c and no stipulation is made regarding a bee journal. However, the association under the present system demands that less than 9% of its members must subscribe to a bee journal and in practically all of these cases the beekeeper is already subscribing to one or more bee journals, else he would not know anything about the association or be interested in its aims and purposes. During the past year one member was lost and several complained because they did not get two years of a certain journal included with their dues since the price for two years was the same as one year formerly. On the other hand, it seems probable that our membership could be considerably increased in some unorganized counties by reducing our dues to one dollar per year, at the same time giving our members the benefit of reduced rates, which policy the bee journals, no doubt, will continue to follow.

On the basis of this information and reasons your executive committee deemed it advisable to offer an amendment to the constitution reducing the dues of members at large to $1.00 per year, not including a subscription to a bee journal, the fee for affiliation of local members to remain at 50c per member.

When is a Local Association?

There is another point that needs some clarification and that is, when is a local association considered to be an association from the standpoint of the affiliation of its members? During the past year the 50c affiliation fee has been received from one or two members of associations which have not reported any activity during the year. The question is, are these beekeepers members of an association and should the affiliation fee be accepted. A definite understanding on this question may be desirable to eliminate complaints and confusion in the future.

The Annual Report

The annual report was ready for delivery in fair time this year but this could be considerably speeded up if local association secretaries and inspectors would see that their annual reports are sent in promptly to the secretary elected at each convention. A number of local secretaries failed to send a report for 1927, and an account of these particular associations was given from what information was previously available.

It may be noted that the inspectors reports are of two types, those covering a period ending June 30, and the others covering the calendar year. Since the calendar year report of bee disease conditions is more informatory as to progress in disease eradication and prevalence of the disease, it would be desirable and much more useful to have all local inspectors reports to cover the year for which our state association report is to be issued. It would be much more satisfactory if the local inspectors would use the blank form provided by the chief inspector for recording numbers of apiaries, colonies and other statistics and then add any additional remarks at the bottom of this blank or on additional sheets of paper.

The annual report for 1927 was mailed to all 1927 paid-up members and all new 1928 members who had paid their dues at the time of mailing of the reports in late July. With this procedure these new members for 1928 should not be entitled to the 1928 report unless their dues are again paid before that report is ready for mailing.

Corn Sugar Legislation

Early in February of this year the dangerous corn sugar legislation about to be rushed through Congress was brought to our attention chiefly through the efforts of Dr. Phillips and the editors of the bee journals. Dr. Phillips apparently was right on the job keeping everyone notified through mimeographed sheets of information which he sent out. The first set of these were recopied by the secretary and sent to all Illinois local association secretaries. Later information was given through our association bulletin. The response by the local association was quite satisfactory with the secretaries of Cook, Montgomery, Jersey, and Stephenson counties sending us copies of letters and telegrams of resolutions and protests against the passage of these bills. Your secretary sent protests signed by the executive committee to the various committees in Congress before which the bills were to be heard as well as letters of protest to our senators and representatives at large, expecting the local asociation to take care of their local representatives. At the very beginning of this correspondence we were faced with the difficulty of entering protests for our association without a resolution covering the particular point in question, although we

did make use of the resolution offered at the 1926 convention. No doubt this question will be brought up again by the Corn Sugar people so this convention should pass a resolution regarding this unfavorable and unsound legislation.

Executive Committee Meetings

Since our last annual meeting two executive committee meetings have been held. The first meeting was at Springfield on March 30 with Dr. A. C. Baxter, Elmer Kommer and Chief Inspector A. L. Kildow present. Deputy Inspector W. H. Snyder was also present. The chief business transacted at this meeting was the preliminary arrangements regarding the summer tour. The complete minutes are submitted herewith.

The second executive meeting was held at Bloomington on November 6, with Elmer Kommer, A. L. Kildow and V. G. Milum present. Preliminary arrangements and suggestions were made for this convention which have been followed with one exception. A kangaroo court was planned but a competent judge could not be secured.

The Second Annual Tour

The second annual tour which was held on August 1-4 covered a 500 mile circuit starting at Bloomington and proceeding thence to Gibson City, Sibley, Strawn, Chatsworth, Ridgeville, Onarga, Buckley, Urbana-Champaign, Monticello, Decatur, Macon, Moweaqua, Findley, Shelbyville, Pana, Ohlman, Witt, Taylorville, Springfield, Mason City, San Jose, Kingston Mines and Peoria. Beekeepers were visited, their system of management explained and other discussions given along the route. Those helping with the speaking program besides the owners of the apiaries visited were Mr. H. H. Root of Medina, Mr. Evertt Warren of Chicago, Mr. Maurice Dadant of Hamilton, and Deputy W. H. Snyder of Decatur. A total of 161 beekeepers signed the registration list with 66 being the largest attendance at any one meeting. Seven cars with sixteen people covered the complete circuit or nearly all of it.

Mr. Harry M. McCaskrin, of Rock Island, Representative in the General Assembly, covered a part of the first two days for the purpose of obtaining more first hand information regarding beekeeping conditions and the needs and problems of the beekeepers in order that he might present the issues before the General Assembly when legislation regarding beekeepers comes before that body. A more complete report of the tour was given in the August-September issue of the monthly bulletin, a complete set of the bulletin being submitted as a part of this report. (An account of the annual tour by Mr. H. H. Root, Associate Editor, Gleanings in Bee Culture, as given in the November-December issues of this

journal under the title "Visiting Illinois Beekeepers" is reprinted in this report.)

Activities of Local Associations

In reporting upon the activities of local associations the secretary must of necessity rely upon information furnished by the local association secretaries, except where the writer has actually helped to arrange for meetings or has attended meetings as a speaker. During the past year, the state association secretary has served in this latter capacity in the following counties: Cook-DuPage, Woodford, Grundy, Piatt, two meetings in Iroquois, McHenry, Will, Saline-Gallatin, Vermilion-Edgar and Jefferson. The latter two associations were definitely organized at the meetings attended on September 13 and July 6, respectively, although the Vermilion-Edgar County Association has not as yet affiliated with the State Association.

Shelby County beekeepers organized their association on March 12 with the assistance of Deputy Inspector, W. H. Snyder, and held subsequent meetings on April 12 and May 12, as well as being included in the annual tour.

The Northwestern Independent Beekeepers' Association was organized late this fall and has affiliated its membership, but no other information is available at the time of compiling this report. The Iroquois County Association, although holding its organization meeting late in 1927, was definitely affiliated for the first time this year. Likewise the revived Grundy County Association was linked up with the State Association at a meeting on February 11.

(The Secretary's report on activities of other local associations are omitted from this portion of the printed report because of being fully covered under the activities of local associations.)

In spite of your secretary's plea for co-operation in arranging meetings in a series in order to conserve the time and energy and expenses of the speakers only a few consecutive meetings were arranged. Thanks to the co-operation of the local associations of Mercer, Henry and Rock Island, these counties were included in a series on June 21 to 23 with Mr. H. C. Dadant and Chief Inspector A. L. Kildow as the principal speakers. Chief Inspector A. L. Kildow was able to cover another series during the week of May 7-12, which included Kane, DeKalb, Will and McHenry Counties.

Other meetings for beekeepers exclusive of local meetings held during the year were the Short Course during Farmer's Week at the State University, January 10-13, The Interstate Beekeepers' Meeting at Dubuque on July 25-26 and the Second Annual Tour of the Association. It is to be regretted that only eleven Illinois beekeepers, including three speakers on the program, attended the Dubuque meeting.

The Source of Our Memberships

A survey of the association memberships records for the past year shows that the Cook-DuPage Association has contributed the most members, affiliation fees for 76 members having been sent in by its secretary. At the end of this report is a table showing the contributions to our membership by counties during the period of December 1, 1927, to December 1, 1928.

Our 1928 memberships by months when paid is as follows:

December (1927) or previous, 77; January, 1928, 43; February, 94; March, 25; April, 68; May, 63; June, 48; July, 40; August, 33; September, 12; October, 38; November, 4. The total membership on December 1, 1928, was 545.

A total of 301 beekeepers who last paid their membership dues in 1926 have been dropped from the mailing list. A total of 319 who last paid in 1927 before December 1 have been dropped. If the association could attract these 620 members into the fold again, a combined membership of 1150 would not be an impossibility. What can we do to hold our membership?

The following facts on solicitation of memberships dues is of interest. Of 85 members previously dropped but not notified, an invitation to pay their dues being sent on April 30 with a sample copy of the bulletin enclosed, 12 members have since been placed in good standing.

Out of 222 members notified on April 30, 1928, that their names were to be dropped from the mailing list, 24 have responded or have been reaffiliated, through their local association secretaries.

Of 475 former members sent an invitation to renew their membership on May 18, 1928, a sample copy of the bulletin being enclosed, two persons responded.

One hundred and fourteen members were sent an appeal to pay their dues on October 13, 1927. These included those whose membership expired during the period from January 1 to June 30, 1928. Up to December 1, responses from 12 of these had been received.

Totaling the above, we find that of 896 beekeepers who have been members since 1922 who were written during the past year, only 50 have been reentered on our membership roll in good standing. Some 16 letters were returned showing death of the beekeeper or moved to unknown address.

There are now 129 beekeepers who have dropped in arrears since June 30 who have not yet been notified or solicited to pay their dues.

From the figures quoted on the source of our membership and the results of direct solicitation it is apparent that the local association must bear the burden of holding up or increasing our memberships. Your secretary should like to suggest that a committee be appointed to draw up rules for a membership contest,

the winning association to be awarded a suitable trophy to be held for the period between conventions. In order to give smaller counties and associations an equal chance some percentage basis of award would have to be used. For instance, with the previous year's total membership as a basis, a point might be given for each percent of old members retained plus two points for each per cent of new members.

The membership figures for the past year as presented in this report could be used as a basis for calculations, eliminating those counties from eligibility for the trophy who had not held a meeting during the past year or who had less than 10 members.

One of the things that has held our members is the benefits of inspection for with the lapse of inspection service on June 1 there was an apparent decrease of interest in local association activities. A secretary of a local association recently wrote, "We must have inspection or our association will cease to exist." It, therefore, appears that the State Association and local associations must back up all efforts in securing a larger appropriation for inspection for the next biennium.

There must be other ways of keeping up our membership and keeping everybody satisfied. Some of the things being done by other associations are listed in the December issue of our monthly bulletin, a copy of which you have in your hands. May it be suggested that those present read pages 2 and 3 for possible hints as to future activities.

OUR 1928 MEMBERSHIP BY COUNTIES AND 1929 CONTEST RATING

First figure = elapsed membership since 1922 = 922.
Second figure = actually paid up Dec. 1, 1927 - Dec. 1, 1928 = 545.
Third figure = membership contest rating (includes to Oct. 1, 1927).
( ) = membership at large in 1928 = 55.

Adams 3
Bond 1
Boone 3
Bureau ..... 3-(2)
Calhoun 1
Carroll ..... 0-(1)
Cass ..... 1-(1)
Champaign ..... 14-7-21-(1)
Christian 10-2-12
Coles 1
Cook-DuPage ..... 128-76-84-(6)
Clark 16
Crawford 1
DeKalb 9-27-27
DeWitt 2
Douglas 2
Edgar ..... 1-(1)
Ford ..... 2-(1)
Franklin ..... 52-(2)-54
Fulton 12-14-14
Gallatin and Saline 20-12-13
Green ..... 0-(1)
Grundy 8-8-16
Hamilton 1
Hancock 10-16-17
Henderson 2
Henry 52-41-45
Iroquois 0-16-16
Jackson ..... 28-(1)
Jefferson 0-15-15
Jersey ..... 17-(1)-18
Jo Davies 11-16-20
Johnson 17
Kane 31-13-13
Kankakee 4
Kendall ..... 18-(1)
Knox 6
Lake 3
LaSalle ..... 12-(6)
Livingston ..... 7-(2)
Logan ..... 24-(2)
Macon ..... 11-(2)
Macoupin ..... 1-(2)
Madison ..... 3-(1)
Marion 23
Marshall 2
Mason ..... 16-(1)
McDonough 1
McHenry 11-16-16
McLean 21-15-18
Mercer 1-26-26
Menard 5
Montgomery ..... 23-12-12-(1)
Morgan ..... 3-(1)
Moultrie ..... 30-(0)-30
N. W. Independent 0-12-12
Ogle-Lee 17-11-14
Peoria 11-19-20
Perry 2

Piatt 9-22-22	Scott 1	Wabash 1
Pike ..... 1-(2)	Shelby ..... 1-21-21-(1)	Warren 22-3-25
Pope 4	St. Clair 2	Wayne 1
Pulaski 12	Stephenson..... 6-10-10-(5)	Whiteside 6-11-25
Rock Island..9-12-12-(1)	Tazewell ..... 11-(1)	Will 7-10-10
Sangamon ..... 13-(4)	Union 18	Williamson..29-10-10-(1)
Schuyler ..... 1-(1)	Vermilion ..... 3-(1)	Woodford..... 52-17-20-(1)

REGISTERED ATTENDANCE AT 38th ANNUAL MEETING OF THE ILLINOIS STATE BEEKEEPERS' ASSOCIATION AT SPRINGFIELD, ILLINOIS, DECEMBER 6-7, 1928

Name	Address	County	No. of Colonies	Comb or Extracted Honey
A. L. Kildow	Putman	Putnam	260	Both
J. N. Koritz	Buckley	Iroquois	70	Both
Louie Vannis	Harrisburg	Saline	35	Comb
Lawrence Peterson	Kewanee	Henry	203	Both
Edwin Peterson	Kewanee	Henry		
Frank Bishop	Taylorville	Christian	150	Both
Edw. C. Heldt	Stanford	McLean	146	Both
C. F. Heldt	Bloomington	McLean	42	Both
W. H. Force	Champaign	Champaign	70	Both
W. H. Williams	Pekin	Tazewell	42	Comb
A. C. Baxter	Springfield	Sangamon	61	Both
Elmer Kommer	Woodhull	Henry	70	Both
C. A. Mackelden	Jerseyville	Jersey	35	Comb
J T. Hendricks	Chatsworth	Livingstone	108	Both
S. A. Tyler	San Jose	Logan	200	Both
A. G. Gill	Chicago	Cook	1	Comb
J. R. Wooldridge	Chicago	Cook	108	Extracted
Val. W. Heussner	Lemont	Will	38	Extracted
Benj. H. Fischer	Roanoke	Woodford	30	Extracted
John O'Brien	Newark	Kendall	164	Comb
B. F. Bell	Kingston Mines	Peoria	162	Extracted
Mrs. Bell	Kingston Mines	Peoria		
C. J. Anderson	Morris	Grundy	130	Extracted
Emory Warner	Monticello	Piatt	75	Both
Roy Roselieb	Prophetstown	Whiteside	85	Extracted
Edwin Kommer	Andover	Henry	153	Both
C. E. Bowen	Lyndon	Whiteside	130	Extracted
C. W. Duerrstein	Galena	JoDavies	55	Comb
George W. Lynn	Lockport	Will	140	Both
Otis Kelley	Marion	Williamson	60	Both
Roy Annear	Mulkeytown	Franklin	47	Both
R. C. Merideth	Whittington	Franklin	36	Both
S. S. Claussen	Oregon	Ogle	55	Both
Ralph Annear	Mulkeytown	Franklin		
Jake Foey	Mechanicsburg	Sangamon	50	Both
E. H. Stanley	Dixon	Lee	275	Both
John Dineen	Springfield	Sangamon	12	Extracted
O. R. Matthew	Virginia	Cass	140	Both
Mrs. Matthew	Virginia	Cass		
Carroll Swanson	Hamilton	Hancock	10	Comb
C. O. Miller	Irving	Montgomery	15	Extracted
T. M. Miller	Irving	Montgomery		
M. D. Farrar	Urbana	Champaign		

Name	Address	County	No. of Colonies	Comb or Extracted Honey
Edward Glotfelty	Springfield	Sangamon		
F. A. Amos	Decatur	Macon	4	
Mrs. A. L. Kildow	Putman	Putman		
H. E. Barnard	Indianapolis	Pres. American Honey Institute		
E. W. Rittler	Quincy	Adams	215	Both
H. C. Dadant	Hamilton	Hancock	400	Extracted
F. R. Belt	Canton	Fulton	50	Both
H. L. Williamson	Springfield	Sangamon		
Mrs. J. H. Bearden	Taylorville	Christian		
George Sloman	Pawnee	Christian	4	
C. R. Taylor	New Berlin	Sangamon		
W. E. Votrian	Springfield	Sangamon		
J. Emmett Scott	Carthage	Hancock	150	Both
Mrs. Louis Scott	Carthage	Hancock		
P. H. Tracy	Urbana	Dairy Dept. Univ. of Illinois		
H. H. Root	Medina, Ohio	Medina	1200	Extracted
V. G. Milum	Champaign	Champaign	(53	Univ of Ill.)
Jas. A. Stone	Farmingdale	Sangamon	18	Extracted
Ernest J. Campbell	Springfield	Sangamon	33	
M. E. Bray	Litchfield	Montgomery		

WEIGHING BEES FOR PROFIT

(The use of a scale colony)

(M. D. Farrar, Urbana, Illinois)

The value of using a set of scales in the apiary is often not fully appreciated by beekeepers. The larger producing beekeepers have included scales in their equipment for many years, but the owners of smaller apiaries also have need for a scale colony. It is a valuable indicator in any apiary, but is especially necessary in the out-apiaries where the beekeeper is unable to examine his bees daily. The condition is especially true where the beekeeper has his out-apiaries widely located and subjected to varied conditions of flora.

In introducing the use of a scale colony to less experienced beekeepers, I wish to emphasize the fact that there is nothing complicated about the equipment or the method of using it. The time required to care for the colony would not amount to over five minutes a day in the home yard. The records can all be made after sundown (during the honey flow). Almost any form of platform scales that have a capacity of from 500 to 1000 pounds will serve the purpose. If the scale capacity will permit, two colonies may be mounted on the same scale and thus approach a truer average of what the colonies are doing. A convenient place for marking down weights can usually be arranged near the scales. During the honey flow the weight of the colony should be recorded each evening after the bees have ceased to fly. By simple subtraction or addition with the weight of the previous day, the change for the day can be determined.

The use of scales in the apiary need not be confined to the season when the bees are storing honey in surplus. The beekeeper should also know the exact net weight of each colony before it is packed for the winter. Scales should be used again in the spring to determine the relative loss of stores during the winter. As brood rearing increases in the spring, the honey supply disappears rapidly and unless some check of weights is made during this time, valuable colonies may be lost thru starvation within a few weeks before the honey flow. The saving of one or two strong colonies at this season might easily pay for the cost of a set of scales. The observance of daily changes of scale colony during the honey flow has already been mentioned. After the honey flow is over there is often a use for the scales in the honey house. These are only a few of the uses that a beekeeper may have for scales that would justify their purchase.

To explain more fully just what is going on within a colony of bees throughout the year, several charts have been prepared. Chart

No. 1 is not based on data secured from any one colony but rather is based on a hypothetical colony. The upper half of the chart is designed to show what happens to the stores of honey within the colony. The curve represents the weight of the net stores of honey within the colony during the year.

Starting with a colony in October, let us consider that brood rearing has ceased and that there are sixty pounds of honey within the hive. The colony is packed for winter at that time. During the winter months a well packed colony does not consume a great deal of honey. About the first of March the process of brood rearing begins. From this time on until the main honey flow starts in late June or early July, the honey is rapidly used up at a rate that is determined by the amount of brood reared by the colony. It follows then that it is often the stronger colonies that are in the greatest danger of starvation at this time. In some seasons the bees are able to gather a ligh surplus during fruit and dandelion bloom, but this surplus is not a certainty and often cannot be depended upon to carry the colonies over. If, for example, two colonies of equal strength started in October, one with sixty pounds of stores and the other with but thirty, and if a honey flow failed to materialize in May, the weight curve for the colony starting with only thirty pounds would be in danger of reaching the starvation point long before the main honey flow started. This emphasizes the need of knowing the weight of the colony in the fall. If

Chart No. 1—Net Weight versus Strength of a Colony

on the other hand the colony has sufficient stores to carry it to the time of the main honey flow there is a good chance that it will store some honey during July and August and possibly produce a surplus. The latter part of August or the first of September is usually the end of the main honey flow. The surplus is removed from the colony at this time, leaving sufficient honey for wintering.

The bottom half of chart No. 1 illustrates the relative strength of the colony in bees over the same period as the chart above. If for instance, the colony can be rated as strong in the fall, over the winter period the strength will decline very gradually due to the loss of old bees. This loss of old bees becomes greater as spring brood rearing starts. If there is plenty of honey in the hive, this replacement in the spring of old bees with young ones will take place naturally and although the colony may appear much weaker in the spring than in the fall, by the first of May the colony should begin to gain in strength and by the time the honey flow starts, it should be rated as a strong colony. A colony that has not reached its peak in strength by the time the honey flow starts has a poor chance to be a profitable colony for the beekeeper. In comparing the upper and lower graph, it is easy to see the danger from spring starvation when the bees are reaching their maximum strength and the food supply is at its lowest. After the beginning of the honey flow, the strength of the colony will gradually decrease to that of its fall strength.

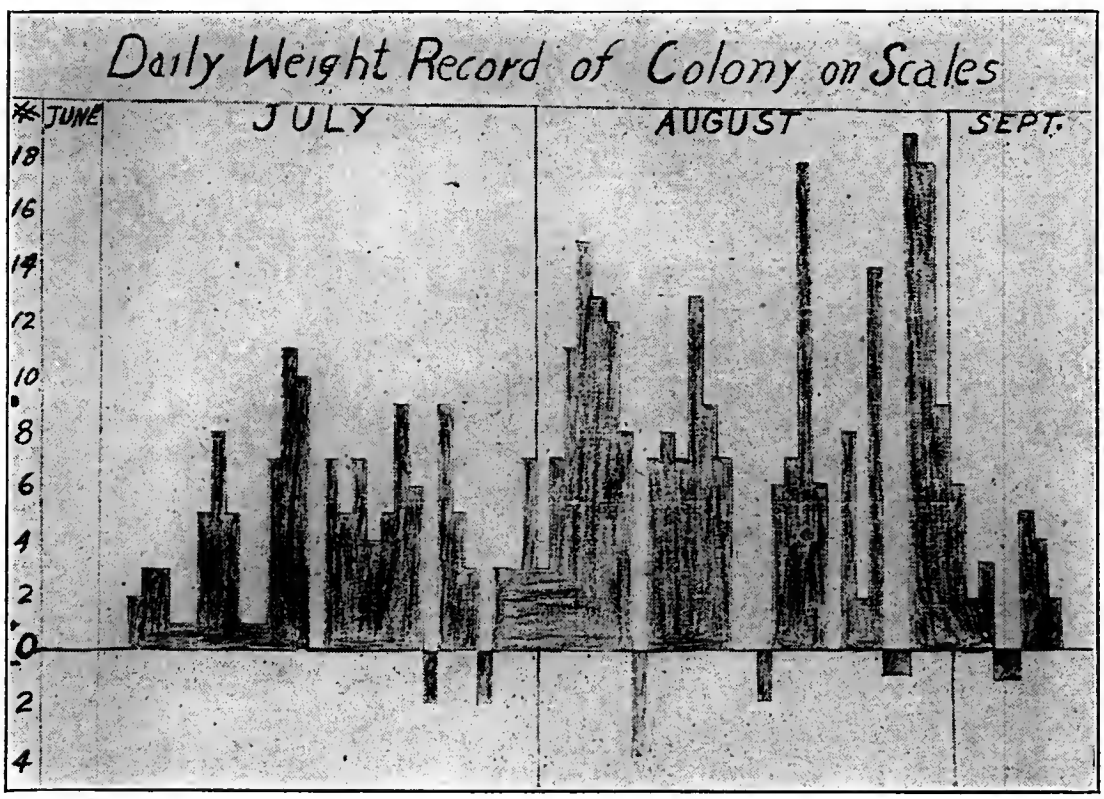


Chart No. 2—Daily Weight Record of a Colony

On the other hand if the strong colony which starts in the fall, winters well and then in the spring runs short of stores any time up until the time the honey flow starts, it is apt then to take the direction of the lower line in the bottom chart and either be severely weakened or die out completely. In either case, the beekeeper has little chance of securing a crop of surplus honey from such a colony. Since it is only the surplus honey that makes the beekeeper his profit, it is only a wise policy on his part to have few such colonies in his apiary at the time when only strong colonies are needed.

Chart No. 2 shows in detail actual records taken from the average of two colonies on a scale during a typical honey flow. Although this particular honey flow perhaps does not match up with the honey flow as observed in another locality, it is typical of any honey flow as they vary mostly in the time for beginning and end, duration or intensity. The same conditions which appear in this chart are apt to appear in any honey flow. (Note: This graph represents the average made by two colonies on the same scale, South Dakota State Agricultural College, Brookings, South Dakota, Summer of 1927.)

A glance at the chart will show that the daily gain in weight of a colony is not a uniform process. In fact there are days when no gain is made and the colony often loses weight. Weather is perhaps the most vital factor influencing the intensity of the honey flow. High wind, temperature, humidity and rain or draught, all have important bearings on the honey flow.

In this particular honey flow, the days on which the bees gathered a noticeable surplus were very irregular. During July hardly enough honey was coming daily to justify an attempt at the production of comb honey. In August the flow was much stronger. both in intensity and duration. During this month bees worked well in comb honey supers. Considering the sharp irregularities during the late August flow, it is easy to see that the beekeeper would have great difficulty in forecasting just what the bees are doing in the supers without the aid of his scale colony.

In fact, the whole record is only typical of conditions during any season. If the beekeeper will but place one of his average colonies on a scale and make the weight deductions each evening, he will find it much easier to plan his program for apiary manipulation.

In selecting a colony to be used on a scale, the colony selected should be typical of his average colonies. A weak colony will often show no gain on the same day that a stronger colony will show a good gain. On the other hand, an exceptionally strong colony will show overly large gains and give the beekeeper a false impression as to what is actually going on in his apiary.

In addition to the actual dollars and cents that the owner of an apiary may save by the use of a scale colony, there is another side

to the issue that often develops. Once a beekeeper has started such a practice of observing a colony of bees on scale, he will soon begin to derive a great deal of pleasure from his observation. If he is a beekeeper at heart, he will get a real thrill out of the knowledge that his scale colony has given a big gain in weight on a certain day and that he discovered the gain on the same day that it happened. This gives him a chance to study the conditions while they are fresh in his mind. It might be compared to the weather report received by radio. It is news received while it is useful.

PRACTICAL HINTS ON SAVING BEESWAX

(H. C. Dadant, Hamilton, Illinois)

Henry C. Dadant
Hamilton, Illinois

It is safe to assert that beeswax is worth saving at all times, as the market for it has remained practically stable over a long period of time. There have been but few breaks in the price and only one can be recalled during the past twenty-five years. Any product which does not fluctuate beyond the average with other commodities, comparatively, as beeswax has been doing, is an encouragement to the producer. Every ounce of beeswax saved is worth while, as one may be assured that the cost of producing and saving it will be well repaid by a price averaging near 2 cents an ounce.

The one break in the price alluded to happened following the close of the World War. This occurrence was rather peculiar and unusual. Several factors contributed to it, the price moving below the low level of many commodities during the adjustment period of 1920 and 1921. In explanation of this, we must go back to the years previous to 1913. Among the statistics of foreign countries, importations of beeswax into Russia were given as 5,000 to 6,000 tons per year. Russia was then consuming from ten to twelve million pounds annually in addition to the beeswax produced in the apiaries of the beekeepers of that country. Since Russia is only beginning to develop commercially, the great consumption of beeswax in that country was confined mainly to candle factories operating for the Greek churches of Russia which were supported by the rule of the Tzar. The churches were wonderfully furnished with most beautiful candelabra, requiring hundreds if not thousands of candles each. The sudden closing of foreign ports followed by the overthrow of Imperial rule suddenly diverted much beeswax to the open market.

In July, 1913, a number of shipments of beeswax destined for foreign ports arrived in New York City and were sold at a price of a few cents per pound below the existing market. This wax, however, was limited in quantity and the market of the United States soon assumed a normal tone. It was not until later that sufficient space on ocean-going vessels was available to transport such commodities as beeswax. Large quantities which had accumulated during seven years in countries such as Africa and South America began to move on to the market suddenly. With Europe buying

little, the market broke to an unusually low record. This, together with a general landslide in all commodity prices in this country, brought about a condition which caused beeswax users to buy only from hand to mouth, fearing every day that new low records would come. Such fears were well founded as large supplies and cut prices continued for months. In fact, New York prices dropped from 45c down to 32c one fine day in May, 1921, and from this point the price steadily declined during the next few months until less than 20c per pound was reached with some sharp declines for a short period of time around 15c.

We need not be concerned today, however. regarding a break in the beeswax price as the market has remained steady since those unusual days. So small a country as the Island of Madagascar exports 1 to 2 million pounds per year which gives us some idea of the import field. The United States imports some 400,000 pounds per month on the average. The use of beeswax is spread over a great many industries, between 50 and 100 being named and over-production need not be feared.

During the first foulbrood scare a few years ago, a prominent authority connected with the beekeeping industry suggested that all bees would need be shaken from combs each year to control diseases. At the period of low prices on honey preceding the war, the same party suggested that colonies might be run for wax production instead of honey. The honey market is sometimes discouraging but low prices would not justify destruction of good serviceable combs. Saving beeswax to this extent is not justified since the one-quarter pound in a comb is worth less than 10 cents while in the apiary its value is at least 25c, in addition to the frame, and usually considered more. It must also be remembered that from 7 to 20 pounds of honey is required for bees to secrete a pound of beeswax. Honey would need be worth but 2 to 3 cents per pound to justify a practice of melting good comb for the wax.

A profitable quantity of beeswax is obtained rather easily by the beekeeper, yet much is wasted or lost. Better methods and a little care will be well repaid by more wax. Some cream of the beekeepers' profit may be found here.

The rendering of material from the apiary containing beeswax has frequently been described as a mussy, laborious and exacting job. Beeswax in the comb or its crude form can at least be saved and shipped to those who make a specialty of reclaiming it in case the beekeeper decides not to render it himself.

Up to the present time, honey has hardly kept pace with beeswax as a staple product of the market. The four principal reasons for this are: (1) honey has increased in production faster than beeswax, (2) during our modern practice there are a great many more uses at the present time for wax than honey, (3) other sweets,

principally sugar, flood the market, and (4) there is undoubtedly a lack of proper distribution and demand for honey as a food.

The beginning of the development in the production of beeswax and honey dates back to the time when the ancients kept bees in any convenient log, box or old time receptacle. In those days, beeswax was prized, as it was probably the only kind of wax available. The crude methods then in use of keeping bees and harvesting their products have not been improved upon to any great extent in parts of such countries as Africa, South America and even some localities in Europe. The natives of some countries still follow the method of destroying the bees, straining the honey through cloths and melting the wax by crude methods. In fact the combs

Most hives will deliver a harvest of wax.

containing decayed dead bees and brood are melted together in holes in the ground over a slow fire which accounts for the reputation of rank odor of African beeswax.

The writer wishes to appeal here to beekeepers. Please keep comb separate from cappings as the rendering process of each is quite different. Do not allow bees to get into your comb barrel and if brood is present, boil the combs at once with plenty of water. There are few materials more foul than dead brood and the beeswax resulting is a poor grade, not worth full market price. Moreover, much work is necessary to purify it. In some parts of Europe, owners of bees still keep them in immovable comb boxes, practice

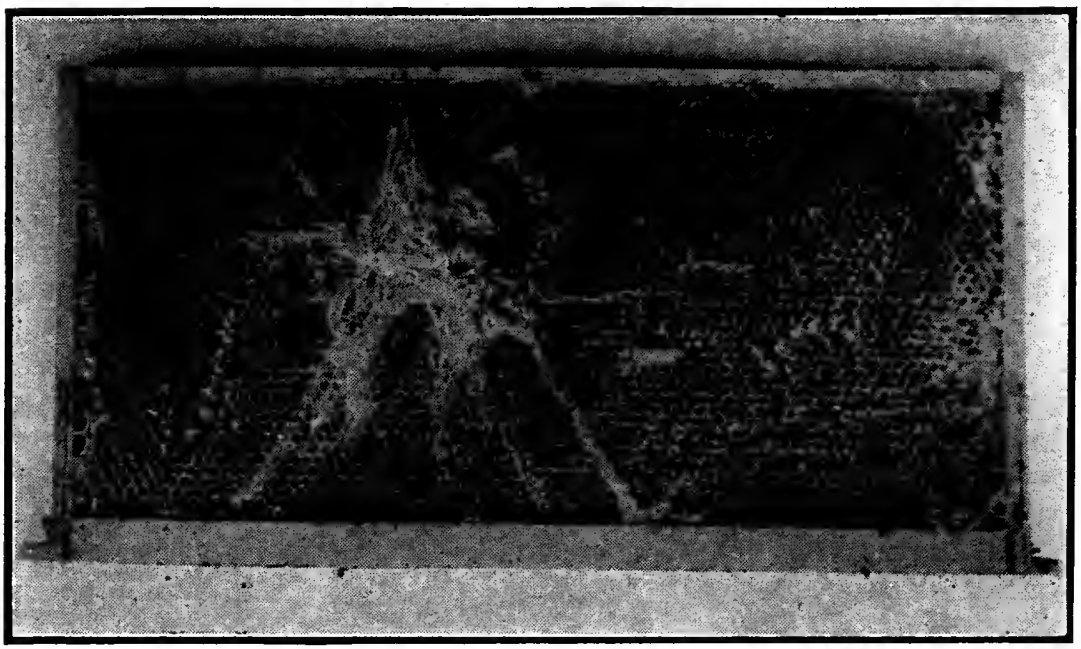
killing them at the end of the season, after which the contents of the crude hives are sold to a central plant where the honey and beeswax are reclaimed.

Modern methods of beekeeping have practically replaced the old, until today each one of us is obliged to adopt economies in producing and saving the beeswax and honey in order to compete with our fellow producers. Beeswax may be lost at several different points about our apiary. Destruction by moth is probably where the greatest waste occurs, both in the apiary and honey-house. Hundreds of combs are sometimes destroyed by the moth in a short space of time. In the latitude of central Illinois, moth may destroy combs as early as May and continue throughout the summer and early fall. Hard freezing weather kills them in all stages and the only places moths may survive our cold winters is when hidden in the hive in some corner or crack away from the

Here is the adult beemoth whose eggs give rise to the destructive worms that live in the combs.
(Reprinted by courtesy of the American Bee Journal)

bees and yet protected by the heat of the cluster. They may also survive in heated buildings where bee combs are stored. Combs in a tight box or good fitting hives are quite safe from moth in spring and perhaps early summer after passing through a cold winter. Although several weeks are required for the moth to develop during very cool weather, they grow rapidly in the heat of summer, the range being from about 4 weeks in summer to 20 weeks of our mild winters in the southern states from the egg to the miller. In fact the full development of the moth has extended over 31 weeks in temperatures just above freezing as shown by F. B. Paddock.

It is necessary to inspect combs at least once a month and treat them if necessary with such materials as paradichlorobenzene, carbon bisulphide, or sulphur fumes in order to destroy them and their larvae. Care should be taken to give combs a second fumiga-



Tunnels of the beemoth larvae through wax of comb. Finally the comb is entirely destroyed.

tion within two to four weeks as larvae in cocoons are well protected and may survive the first fumigation. Moth have been known to destroy comb foundation slightly and have even been found inside the cracks of cakes of beeswax although their consumption of beeswax in these cases is slow and small.

Cocoons of beemoth on wood of frames. From these come the moths that lay eggs for the next brood of worms.
(Reprinted by courtesy of American Bee Journal)

A strong application of paradichlorobenzene will kill moth. In fact Geo. Watt of the Dadant Apiaries reports that a pound of crystals sprinkled over a high tier of supers and then closed tightly produces a gas quickly and does the work well. In case combs are not infested by moth, a tablespoonful per hive body on a paper on top of the tier acts as a good "Keep out" sign. Paradichlorobenzene produces a heavy gas, is not poisonous to human beings, and is, therefore, quick to apply, besides being reasonable in cost. A tablespoonful of carbon bisulphide poured on a cloth or placed in a dish on top of the frames is sufficient for one or two hive bodies. The liquid produces a heavy gas and is well suited to treat a high pile of supers in the honeyhouse but as it is inflammable like gasoline, the crystals mentioned above are much preferred. Hives and supers should fit tightly to prevent escape of gas through cracks. Discarded combs saved for rendering should be also treated to prevent ravages of moth. The burning of sul-

A. Ready to put moth fumigator at top of a stack of combs.

B. Same comb stack covered and safe from moths.

(Reprinted by courtesy of the American Bee Journal)

phur is cheap and good, especially when the entire honeyhouse is to be fumigated. Two pounds of it should be sufficient for the ordinary small honeyhouse. Five pounds burned rapidly may be needed in case of a larger building or one that is not tight. All combs should be well exposed; boxes of combs emptied on the floor and supers staggered in the tiers to allow free circulation of the sulphur fumes.

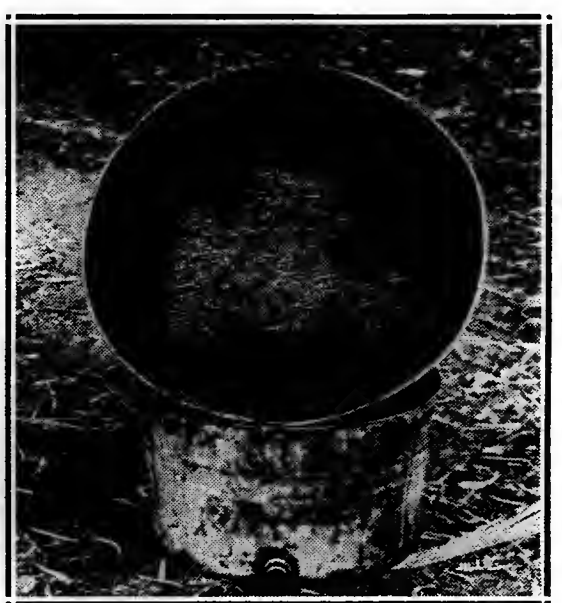
Beeswax may be wasted or lost by allowing combs or scrapings of wax about the apiary to lie on the ground to be melted down by the sun and lost. Formerly, one of the best methods to encourage saving of wax scraps about the apiary was to have a solar wax extractor nearby or a box about the apiary into which material of this sort could be placed. With the coming of bee diseases, however, it is best to carry all wax material into a building

where the bees cannot have access to it and where it can be saved and fumigated occasionally against moth until rendering can be done.

Various methods of reclaiming beeswax are practiced, depending upon the material in hand. We shall consider the methods of procuring beeswax from cappings, discarded combs new and old, refuse such as sediment scraped from the bottom of wax cakes and water-soaked wax, unfinished sections, slumgum and propolis.

In rendering material about the apiary, the beekeeper must keep in mind that beeswax is lighter than water. In fact its specific gravity is about .965 which causes it to float readily on water. If

A. A capping can large enough to hold a day's run. When drained the caps are ready to melt into cakes.



B. A smaller home-made outfit that does well for the small beekeeper.

(Reprinted by courtesy of the American Bee Journal)

cooled slowly, sediment will settle to the bottom of wax, which is important.

The glass bottles I have here show clearly how beeswax separates from its impurities by gravity. The beeswax floats and is the top layer. Immediately below is the layer of light refuse. cocoons, dead bees, etc. This material should always be saved as it is rich in wax. The fairly clear liquid underneath is discolored water while at the extreme bottom is heavy dirt, impurities and propolis. Wax worth saving is seldom found here.

Cappings are secured by cutting away the wax sealing from the surface of combs of honey previous to extracting honey from

the latter. If cappings are cut thin with a hand knife, about 1.2% of the honey crop in weight harvested, on the average, will be secured in beeswax. Uncapping, however, is often hurriedly done and cutting ⅛ inch or more in depth into the comb results in a greater percentage of wax. As some side wall of brood comb is often cut into, more impurities are present than in the case of thin cappings. Before rendering the wax, the removal of honey from cappings should be done as efficiently as possible. In fact, much honey is sometimes wasted by allowing it to remain in the cappings when the beeswax is rendered.

Two principles are generally followed at the present time for removing honey from cappings; (1) draining by gravity or centrifugal force and (2) a heating process with capping melter. In using capping melters, the problem is one of temperature since the melting point of beeswax, about 145 degrees, is the same as the limit to which honey can be heated without injury. Beyond 145 degrees, honey is liable to become damaged considerably both in color and flavor. It is a problem then of not overheating the cappings and yet bringing them to a liquid condition with the beeswax barely melted. In the operation of the capping melter, there should be frequent inspection in order that clogging does not take place, thereby preventing honey and wax from remaining on the hot surface of the capping melter after the cappings become liquefied. A temperature of 150 degrees is not too high provided it is of very short duration. Capping melters operate best while cappings are warm and fresh from the combs with honey adhering to them. There is probably room for improvement in devices of the kind both for saving the beeswax and the honey conveniently.

If the draining method is practiced, the cappings should be broken up as finely as possible by stirring them briskly with a clean wooden stick every twenty minutes or less during the day while the uncapping is being done. This idea is the result of experience showing that honey will drain away from small pieces of wax more readily than larger flat pieces of cappings. The draining should, of course, occur during very warm weather or while the can of cappings is standing in a heated room of hot summer temperature. Another method which is being practiced by some who have power machines, is to throw the honey out of the cappings by centrifugal force. In either of the last two methods, the honey remaining is usually fully as much if not more by weight than the weight of the wax present. This honey may be washed out in water at about 125 degrees and the sweet water used for vinegar making or the cappings may be melted over a capping melter to separate the remaining honey. The honey secured by the latter method will usually be offgrade on account of overheating but may be sold to the bakery trade at a reduced price.

Separating cans are usually used in connection with capping melters. Since the weight of beeswax is but two-thirds that of honey, the wax floats readily and is easily separated by gravity. Hot water should be added to the beeswax delivered from a separating can to dissolve all stickiness of honey and allow sediment or impurities to settle. Otherwise the wax may require remelting in hot water.

The beekeeper will find that there is nearly always some sediment at the bottom of the cakes. In fact if the boiling is excessive, considerable residues may occur but they should always be saved. The appearance is such that beeswax does not seem to be present, as it may look like water-soaked pollen or corn meal. Residues of this kind are sometimes called water-damaged or water-soaked beeswax. Nevertheless scrapings and sediment should be saved and the best plan is that they be allowed to dry. After the moisture is evaporated, the remaining material will be found to be almost pure beeswax and may be rendered in a solid cake by heating in water and cooling or by rendering in a good wax press. Material of this sort is shown. The moisture removed by evaporation was 82% of the original water-soaked sample by weight. Eighteen per cent beeswax was therefore easily salvaged which is certainly worth saving.

The rendering of fresh scrapings from frames or newly built comb, including comb which has been in use in hives not over a year or two, is quite simple. Such material contains almost pure beeswax with very little refuse and may be readily rendered into a solid cake of wax by heating in hot water without the necessity of boiling. It is best, however, to always boil wax in water at least thirty minutes in order to avoid the possibility of allowing any disease germs to survive. The loose sediment or scrapings from the bottom of cakes of wax from this source or any other should also be saved as it will be found to be rich in beeswax regardless of the fact that the appearance of such material causes one to believe that it is worthless.

Rendering old bee combs is quite the most difficult problem and most disagreeable of all the mussy work which a beekeeper may find it necessary to do in connection with beekeeping. The yield of beeswax from combs, however, is very profitable and not a single bit of comb should be wasted. Several different methods have been practiced when securing beeswax from combs. They may be placed in two classes. 1. Where the beekeper desires to save his frames and the wire in them, the combs are placed in a hot water tank and after they are loosened from the wood, the frames are placed in another tank for boiling and sterilizing. Frames saved in this way should not be piled out-of-doors in the sun as they will warp badly. It is a question, however, whether the rusty wires are worth saving. In fact, this method is not likely to yield

as much wax as the one to be described in the next paragraph. The comb found floating in the hot water is dipped into a wax press so constructed that it will receive one cheese of the material wrapped in burlap sacking and pressure is brought down immediately while the whole mass is quite hot. The press is so constructed with slats on the inside surface as to allow the wax freedom to run rapidly out of the cheese as it is being pressed. Pure beeswax is, of course, also found in liquid form on top of the water in the tank and may be dipped out. A more convenient method, however, is to float the beeswax off through a wide overflow spout by adding water to the tank at the bottom through a pipe connection.

2. What is believed to be a more efficient method of rendering old combs, is to first break up the combs as much as possible and soak them for a period of twenty-four to forty-eight hours in water without heating. Water at any temperature below the softening point of beeswax will be satisfactory. The combs should first be crushed as much as possible. The great advantage of this method is that the combs become well water soaked, all parts of the comb and cocoons filling with moisture. The comb is then ready to be boiled in a wax press under water. This arrangement causes the beeswax to melt throughout the comb and as all spaces are filled with water, the beeswax having no place to locate or be absorbed runs readily out of the comb and will be found floating on top the water. The best style of wax press made to carry out this procedure can be built at home at moderate expense. The whole arrangement is that of the old time cider press with racks or slatted mats between cheeses, except that the pressing is done under boiling water. Great pressure is not needed. In case a capacity of about seventy-five pounds of beeswax per day from three hundred combs is desired, a wax press should be constructed about 20x20x20 inches. A press of smaller capacity, about 16x16x16 inches would do well for the smaller beekeeper. There should be an opening in the bottom for drainage and by installing a suitable valve and T with pipe up from this point, water may be conveniently supplied. Two wood slatted mats are placed between three cheeses consisting of one inch strips of wood nailed together with one inch spaces between them. A metal mat is best for the bottom as direct heat decays wood rapidly. On top is placed a strong slatted wood follower board made of four inch boards with metal plate on top of it to receive the end of the pressing screw and the machine is completed by the addition of a heavy screw and threaded socket such as a bench screw used in wood vice or soap press. The socket is, of course, anchored on a cross bar to the top of the press for proper operation of the screw. One of the best examples of this type machine is the Hershiser wax press. The water should be kept boiling well continuously and the screw turned down occasionally. Heavy pressing is not necessary and in fact the screw

Hershiser wax presses for rendering wax from combs. Note cheeses, pressure boards and copper kettles for the wax.
(Reprinted by courtesy of the American Bee Journal)

should be turned up occasionally also in order to cause a washing in and out process throughout the cheeses while the water is being kept about the boiling point. An apparatus of this kind requires but little attention except to see that the water is kept hot and the screw turned down occasionally. Cheeses are made by packing the comb compactly in burlap which has been spread over and down into a wood form 15x15x6 inches. A good, large, porous sack ripped open is very good for the purpose, being folded over and the flaps pinned together with nails. During the pressing and boiling they are finally reduced in thickness from six or eight inches down to one or two inches within the course of three or four hours. The remaining refuse may then be thrown away with a minimum of wax lost. The beeswax found on top the tank is floated out through a wide spout about 6 inch by 1 inch by adding water through the supply pipe at the bottom.

Judging from the small number of wax presses sold, beekeepers are in many cases not saving near all the beeswax about their apiaries. In fact, so few machines are bought that they do not justify the cost of devoting space to them in a bee supply catalog. It is true, however, that many producers lacking proper equipment and time are shipping wax refuse to extraction plants in winter.

The weight of the material to be rendered, whether cappings, combs or refuse, has little to do with the amount of beeswax that may be expected from them. For instance combs which contain considerable pollen and perhaps honey or are heavy with the accumulation of years of cocoons, contain no more beeswax than comparatively new combs and the beeswax is much more difficult to remove when they are heavy and old. Generally, therefore, less beeswax per comb is secured in the case of heavy combs. Cappings may also be quite heavy with honey and contain many more times of honey in them, by weight, than the beeswax. Considerable honey may be wasted in this way. I have seen attempts to render cappings which were so heavily charged with honey, that several changes of water were necessary to finally dissolve all the honey in the cappings and finally reduce the beeswax to a good solid cake without being sticky.

Granting that full sheets of foundation have been used in the base of ten new combs, which represents about 1½ pounds of beeswax, one can expect that bees will add about one hundred per cent of wax in completing the combs to full depth or another 1½ pounds of beeswax, making a total of three pounds. It is hardly possible on the average, however, to secure three pounds of beeswax from ten Langstroth size brood combs, for in some cases the combs will not be of full size, there frequently being a space without combs at the lower corners and along the bottom bar. Then, too, it is not possible to expect to reclaim all the beeswax, particu-

larly from old combs. For these reasons, about 2½ pounds of beeswax on the average may be expected from ten Langstroth size combs.

The old simple method of rendering combs by placing them in a sack and submerging in boiling water with no other attention than occasionally poking, squeezing and turning the sack in order to aid in removal of some of the beeswax is very inefficient. This method, however, will serve very well where combs may possibly be infected with disease and the beekeeper must sterilize them before making shipment to a good wax extraction plant. Most certainly no combs which have been occupied by diseased bees should

Wax in cakes and in sacks. Neat cakes handle easy and ship well.
(Reprinted by courtesy of American Bee Journal)

be shipped without first sterilizing in boiling water and then drying before packing for shipment. In fact, combs from diseased bees had best be burned, for American foulbrood in particular will reappear at every possible opportunity. Stamping out this disease is much more important than the saving of beeswax. Combs containing honey should not be shipped under any consideration at any time. The best season of the year to transport combs is during the winter time and the packing should be in good, double sacks.

Slumgum is a word used to name the refuse remaining after some beeswax has been rendered from combs. It may be more or less rich in beeswax and is usually dark brown or almost black in

color. Unless the beekeeper is provided with a very good wax press and devotes proper care and time to the job, there will be enough available wax in the slumgum to more than pay for having it rendered properly by someone making a specialty of comb rendering.

It is important to save the beeswax in the form of drawn combs even in comb honey sections. E. M. Cole claims a colony started on a full super of bait sections harvests a full super of honey more, than one with foundation only. Most of us know the importance of saving our good combs from damage and how much more valuable they are in that condition for apiary use than a poor comb is for wax.

Contrary to the popular belief, the rendering of beeswax from propolis is not very valuable. The beekeeper should not confuse propolis with bits of wax from frame scrapings which frequently contain almost pure beeswax as burr combs do. In scraping frames, it would be well if all propolis could be kept separate from the true beeswax scrapings. Propolis is readily recognized especially in warm weather by the strong tendency of it to stick or adhere to the fingers and anything with which it comes in contact. Propolis is reported to contain 30 to 70 per cent of beeswax but in these cases, burr combs were no doubt scraped from the frames with it. Propolis in the purest state as obtained from frame scrapings, is found by two authorities to contain not over 12 to 20 per cent beeswax. It has a tendency to cause beeswax to stick to it so firmly that no method has been found whereby much beeswax could be rendered from it except by solvents. So well does it retain its hold on beeswax that some wax which otherwise would rise to the top of water will remain at the bottom with the propolis even when hot. Solvents such as turpentine, chloroform, ether, hot benzine, carbon bisulphide, carbon tetrachloride, and other liquids have been used with some success. The resulting beeswax, however, is changed to some extent. The cost of the liquid and process of reclaiming it by distilation in addition to the cost of the outfit has made the solvent process too expensive for practical use.

Following the idea of the solar wax extractor, which cannot be used except during the hot months of the year, Dr. C. C. Miller tried rendering combs in a hot oven during winter. This method has never been carried out to practical use, however, and the problem of holding the proper temperature would no doubt be difficult without injuring the beeswax. In fact when wax is boiled with water, it cannot be injured even though boiling is continued for many hours. However, as soon as all the water has boiled away, heating should cease for the temperature of the wax then rises above 212 degrees. Beeswax is liable to injury in a similar way as honey and the temperature must be watched. While honey should not go beyond 140 to 150 degrees, beeswax will be injured very slowly at 250 degrees,

and above 300 degrees rapidly. Beeswax will not boil without water, but scorch, smoke and finally burn at high temperatures.

Tanks used in rendering beeswax are made preferably of copper, tin and glass. Galvanized iron will do quite well so long as water is boiled with the wax. Rough iron should not be used in any case as it darkens or discolors beeswax rapidly. Smooth cast of wrought iron kettles will do with water in the wax. Galvanized iron tanks and tin cans for cooling as ordinarily used by beekeepers are satisfactory. The cooling cans are preferably made flaring in shape, to facilitate removal of the caked wax. Hot water poured on the inverted cold can will loosen the caked wax inside.

During apiary work, the beekeeper should be constantly on the lookout for undesirable combs. They may be removed when found but if some good worker brood is present, place them next to the outside walls of the hive. In that location, brood is less likely to occur and they can be removed later. Another good place for such combs previous to removing them is above an excluder.

What may be considered a poor comb ready for the wax press? A piece of normal size drone comb 3 15/16 inches square, a square decimeter, contains 521 cells. Not more than this number should be found in the entire brood nest in addition to what drone cells may appear along the two or three rows of cells adjoining the bottom bar during a honey flow. Combs containing a few square inches of drone cells but straight and complete may be used for extracting supers and saved from the melting pot.

Don't allow moths to invade weak or queenless colonies. Keep the comb disinfected from moths in the honeyhouse and apiary. The combs in dead colonies of spring should be cleaned, saved and fumigated for future use, if good. Moldy combs will result and be fit only for beeswax if they are not cleaned out and the combs allowed to dry. Junk all poor combs and scraps of wax for the wax press. Keep cappings entirely separate from old combs as only very new comb will render nicely with cappings. Remove all the honey from cappings, thereby preventing a waste of honey and facilitating wax rendering.

Every scrap of material containing beeswax about the apiary should be saved. It is easily done and nearly clear profit.

The fact that it requires on the average ten pounds of honey consumed by bees to secrete a pound of beeswax, should be a reminder and incentive to all, of the value of saving the beeswax.

HONEY PRODUCTION

(F. B. Paddock, Ames, Iowa)

The problem of production is vital in any industry and in beekeeping there are so many factors which are unsolved that the situation is extremely difficult. The price which the producer gets for honey is not based on the cost of production but on what can be obtained. The cost of production is not known so it cannot be used for the basis of price. Attempts have been made to help beekeepers to keep records in an effort to arrive at a cost price. Today we cannot even guess intelligently, much less estimate what honey production costs. The Government has recently undertaken a study among some of the larger producers to ascertain what factors contribute to the costs. This work has already shown many producers that they are extremely inefficient in their methods of operation. If money cannot be made for the producer at present prices there are two plans to follow. The first is to raise the price of honey and the second is to reduce the cost of production. The first plan is not so easy and is almost out of the hands of the producer. The second plan is within the power of the producer. The cost of production must be reduced by better practices such as first class equipment, a race of bees better adapted to honey gathering in a region, better swarm control, more successful disease control, more careful winter practices to reduce 15% losses. Some producers are making money today in spite of all these handicaps and others are not. Some few are making headway to reduce these handicaps.

There is an increasing interest throughout the north in the use of package bees. These have been used quite often to make a start in beekeeping and this plan is as good as any which could be suggested. It offers a means of getting clean stock operated in clean equipment which is a foundation stone to successful production. Many producers have employed packages to make up losses, either from winter or disease. Some have introduced packages into weak colonies but the value of this is open to debate. There have been advocates of the practice of killing all colonies at the end of the honey flow and restocking the equipment with packages the following spring. Experiments were conducted by Dr. O. W. Park of the Iowa Experiment Station as early as 1918 on the cost of producing honey with packages and overwintered colonies. He found that the cost was practically equal for conditions existing in central Iowa. Last year A. F. Karsten of northeast Iowa gave results in favor of packages, even two pounds, in that region. In more northern regions more beekeepers are adopting the package type of production. The evidence at hand would make this plan worthy of trial by more producers. There is still another angle of

the package production as outlined by Morley Pettit of Ontario, Canada. His methods have been unusually successful in the past but the new plan may be even more successful. His proposal is to unite the colonies in the fall and replace the half with packages in the spring. This would automatically requeen every other year and it would reduce the swarm control problem. This is only a step from the Colorado plan which is to double each fall and each spring make the increase from within the yard by new queens. One of the cuts in cost of production must come from reduced winter loss. It may be cruel to kill bees after the honey flow but it is equally as cruel to let bees go through the winter without protection and scant stores so that it is necessary to starve to death in an effort to meet a situation which is forced on them by the indifferent beekeeper.

The improved apiary practices for the last quarter of a century have revolved around good stock. The program has been to secure one race of bees to serve under the varied conditions throughout the length and breadth of this land. There can be no question but that much good has resulted from the interest in good stock and frequent improvement of apiary strains. However, the time is at hand when we need to do more good in order to secure still better results in honey production. It is expecting too much of any race, regardless of its merits, to meet all our local conditions. It isn't done in any other form of animal or plant life, as cattle, poultry, fruits and small grains. It is not sound business for the honey producers to hang on longer to a legend or tradition. The last year or two have seen much interest develop in a race of bees which might meet local conditions better than they are being met now. It is not safe to assume that any one other race will do better under all situations than the one being used now. Work is being done now in several widely scattered districts which indicate that another race of bees will bring greater returns to the producer. This may be due to the ability of the race to winter better, work under unfavorable conditions, resist disease or gather nectar from longer corolla tubes.

The producer must sense the pasture changes that are taking place. Iowa beekeeping has seen white clover go out and sweet clover come in. During the last decade white clover has been less dependable as a source of nectar for reasons thus far unexplained. Crops are uncertain and cannot be forecasted as was the case formerly. Beekeepers and apiaries have disappeared in the old white clover belt. Any revival of production in this area is due to the coming in of sweet clover. Sweet clover made its real start in Woodbury County (Iowa) and has spread in all directions. First the increase was largely along the river but recently the spread is eastward across the state. In the spring of 1928 ten thousand acres of sweet clover were planted in Boone county. All of this

acreage will not be directly available as pasture for bees. Some will be used as a green manure crop, some cut for hay but some will be used for stock pasture and some for seed. There is always some sweet clover getting established in the so-called waste spots. The demonstration apiary results in Boone county indicate very good territory for honey production. There are good possibilities for the beekeeper in those areas where dairy interests use sweet clover for pastures.

The disease situation is always interesting and is mentioned here only briefly. European foulbrood was not uncommon ten years ago. In some areas it was prevalent every spring, in other areas the disease would appear only during the unfavorable seasons. Requeening with a good stock of Italian bees and more active apiary management were recommended. This disease is seldom encountered today. Sacbrood is seen so seldom that it is not possible to make any correlations between its occurrence and conditions of environment. American foulbrood is a factor in the cost of production. It has been shown that the disease can be controlled by area clean-up methods and it can be cleaned up in a locality by a solid community effort after an educational campaign. It takes time and money for this work as well as the cooperation of the beekeepers.

A very close inter-relationship is developing rapidly between the fruit grower and the beekeeper. It had been recognized for many years that the honey bee was an important agent of pollination but only recently has the bee been regarded as a necessity. This situation has developed along with intensive plantings of specialized crops. The grower of prunes, pears and apricots in California has been renting bees for the period of pollination. The cherry industry of the northwest did not flourish until plenty of bees were placed in the orchards to insure ample set of fruit. Bees are rented extensively in New Jersey to aid in the set of fruit in apple orchards and very satisfactory results have been obtained in Illinois by the use of bees scattered throughout apple orchards. The practice has been established in Michigan of renting bees for the pollination of cherries. The wonder is expressed now if there will be enough bees in these localities to meet the demand of the fruit grower. Studies have been made on the management of getting the bees into and out of the orchard and also of the best distribution within the orchard.

There is certain to be a growing appreciation of the value of the bee in the pollination of truck and greenhouse crops. The importance of the bee in the growing of strawberries and raspberries especially will demand consideration when these crops are grown in large acreages. Bees are now used in the large greenhouses for winter pollination of cucumbers and tomatoes.

The value of the honey bee in the pollination of clovers especially is well known but not generally appreciated. The extensive growers of sweet clover seed in North Dakota were anxious to secure plenty of bees and made inducements to beekeepers for the establishment of apiaries throughout the territory. The importance of the honey bee in the pollination of medium red clover is not realized. The importance of the bumble bee in this instance is entirely over rated and founded upon legend.

The development of beekeeping is coincident with the modern plan of general agriculture. The two must be closely associated for the greatest success of either. As the sweet clover acreage increases the opportunities for profitable honey production improve. The welfare of the fruit grower and the beekeeper are mutual. Nectar is produced in nature by many flowers which represents a natural resource of the soil. The honey bee is the only agent which can convert this raw product into a finished product for use by man. When nectar is not collected by the bee it is lost to man. It can be said that many times as much nectar is produced as is gathered by the bee and made available for use by man. When all attention is directed to the utilization of by-products it is certain that the importance of the honey bee can not be overlooked. The functions of the bee are distinctly two-fold, for crop increase through more perfect pollination of fruit and seed, and the conservation of nectar for honey as a further food for man. It must be remembered that the honey bee is of more value to the agriculturist in general than the beekeeper in particular.

Crop Disposal

It is only natural for some to feel that too much attention is being given to increased production. It is the opinion that there is already an overproduction of honey, especially in view of the increase which has been accomplished in the last ten years. In reply to such argument let it be said that the increase in production of honey has only kept up with the increase in population in this country. The consumption of honey in the United States was 2 pounds per capita and in 1928 the consumption was still 2 pounds. The production of honey in this country is estimated at 2½ pounds per capita. No other nation has a honey consumption as low, even Italy has a per capita consumption of 11 pounds and Germany tops the list with 45 pounds. The United States is exporting more than 11,000,000 pounds of honey annually to such countries as Great Britain and Germany. These countries will accept only the superior grades of honey properly prepared and in the best of packages.

The future of honey consumption in the United States is the concern of the producer. There is every reason to believe that there will be more honey used each year in this country. There are three important agencies at work on this problem now and the re-

sults are beginning to show what may be expected in the future. The Kellogg Company of Battle Creek, Michigan, is recommending the use of honey in connection with their food The word honey appears on every package, over a million are produced daily, and in every piece of advertising including store window decorations. The home economics staff of this company is constantly testing new recipes for the use of honey.

The work of the American Honey Institute under the direction of Dr. H. E. Barnard at Indianapolis is gaining by great strides. A big effort of the Institute has been the connection with the baking industry of the United States. The use of honey in cakes is being urged through the schools for bakers maintained by the Fleischmann Yeast Company. Preserves and Honey, Inc., was organized this year after the purchase of the four largest bottling plants of honey. This company has been able to treble the sales of honey at the end of three months effort and they are now engaged in an extensive radio advertising campaign in and around New York. This company has great plans for the future increase in the use of honey by the consuming public.

There is another means of crop disposal which is available to producers everywhere, Cooperative Marketing. This plan has been in operation many years in Colorado but it has not spread rapidly. More recently the Inter-Mountain States Association was developed and the results have been very satisfactory. There is now one cooperative in Iowa, the Sioux Honey Company of Sioux City. The results of this organization have been equal to the expectations of any of its members. Cooperation is the means which has been widely recommended as a relief measure for agriculture and is considered by many as a magic word. According to Ed. G. Brown cooperation is merely the name of a system of loyal, honest endeavor by which a people can lift themselves to a higher level of living. There are three things required for the successful operation of cooperative marketing. Loyalty of membership is probably the most essential. The manager must be one who has been trained in modern business methods and who has a vision. Inadequate financial backing has had much to do with the failure of many cooperatives.

Honey prices during the fall of 1928 tended to rise on the carlots, whereas in a retail way there has been no such strengthening and in some instances there has been a weakening. Perhaps this has been caused by the volume of export sales, perhaps by the increased activity of the newly formed combine, "Preserves and Honey," likely both. These two agencies must have carlot shipments to be economical. And now comes the pooling of several cars of honey by Louisiana beekeepers into New Orleans, a blending of the same, and carlot shipments in turn. Will the markets

in the future become wholesale or jobbing markets asks the American Bee Journal.

The big reason why more honey is not consumed in this country is that the people are not made to want it more than they want a corresponding article of food. The producer in a feeble way has been trying to get honey used but this method has not brought results. Most producers do not know enough about honey to be able to tell its merits and superior points. In the case of any other article of food the marketing agency is telling the public. Every company has a staff to find out the merits of their food and how to use it in ways which are better than any which have been proposed before. It is to be hoped that honey may yet be taken in and treated as other food items are so that the public may be told in an impressive manner. All indications point to the beginning of a new era of marketing and consumption of honey.

COLOR, FLAVOR AND CLARITY OF HONEY

(H. H. Root, Medina, Ohio)

Generally speaking, we know that white honeys are usually mild in flavor, while the dark colored honeys are apt to be strong. In this paper I do not propose to deal with either the color or flavor of honeys in general, but I do wish to discuss the clarity of honey and how clarifying processes often have a bearing, both on color and flavor.

Honey may be cloudy, because of the presence of pollen, bits of wax, or bubbles of air. Pollen and wax are easily gotten rid of and large bubbles of air are of no consequence for in hot honey, especially, they rise to the top and break quickly, so that their presence is not objectionable. Even the bubbles of air introduced into hot honey as the jars are filled, need not concern us, for these are the large bubbles. What I wish to talk about particularly is the presence of very small bubbles of air that might almost be called microscopic air, which are introduced when the honey is extracted.

There seems to be a general impression that a honey pump introduces air into honey and causes the honey to look cloudy. If the pump is run too fast, or if it is left running after the honey is out of the extractor, a pump will introduce some air into honey. The belt should be slipped off whenever the honey in the extractor or can is exhausted. Correctly used, the honey pump has no effect on the amount of air in honey and no effect on the granulation of honey.

Honey that is cloudy, due to the presence of microscopic air, is not only much inferior in appearance to that which is crystal clear, but it also is likely to granulate more quickly, for each tiny bubble of air may become a nucleus for crystals to form. This is also true of fine particles of any foreign material, such as pollen or wax. Therefore, both for the sake of the appearance of the honey and the keeping qualities, so far as granulation is concerned, honey should be put on to the market as clear as it is possible to get it.

There is just one remedy for getting rid of air and that is heat. When the heating is properly done, the air will be driven to the top. After a short while the clear honey may be drawn from the bottom of the tank. Care should be taken not to draw the honey down low enough so that cloudy honey is encountered. Usually it is unsafe to draw down closer than eight or nine inches from the scum, for the honey immediately under the scum is apt to be much more cloudy than that in the lower part of the tank. Heating to a temperature of 160 degrees is safe and as soon as the honey is

clear, say in two or three hours, it may be drawn off at the bottom of the tank.

In case the honey is extremely cloudy and one heating does not clear it up, it is far better to heat twice or even three times, each

H. H. ROOT, MEDINA, OHIO

time cooling it, and not allowing the honey to remain heated for any length of time. The cooling is just as important as the heating. In fact, if you are not equipped to do both, you had better

do neither. Tanks of honey, holding, say fifty gallons, heated to temperature of 160 degrees and allowed to cool themselves, will be several shades darker than the honey originally was and the flavor will likewise be injured by reason of the very slow cooling. For this reason a steam coil in the bottom of the tank is not as good as a steam or hot water jacket. While the steam coil is all right for heating it is a slow proposition for cooling. In the case of the fifty gallon tank, the honey will be injured by reason of its own heat, as it will take nearly twenty-four hours to cool and in this length of time the honey changes rapidly. For this reason, in case of exceptionally cloudy honey, two heatings, or even three, followed by quick cooling, are preferable to one heating to 160 degrees that means maintaining that temperature from fifteen to twenty hours. If a water jacket is used, cold water may be turned into the jacket and the honey will be cooled quickly and taken out of the danger zone, so to speak.

Ordinarily, if the honey is run into jars or cans as soon as it is clear, there is little danger of overheating, especially if a small sized tank is used. In case of a very large tank, say a hundred gallons or more, there is danger of overheating unless the filling is carried on at a very rapid pace. When putting honey heated to 160 degrees into sixty pound cans, the cans should not be piled solid, as they will then not have a chance to cool quickly. Neither should they be put into a wooden case immediately, as the insulation thus afforded will tend to retain the heat and darken the honey slightly, also to alter the flavor. The cans should be piled with plenty of space between, so that air can circulate.

When filling five pound pails, it is better not to put them into the cartons immediately, especially if the cartons are piled up solid, for the heat is retained by this process, enough to injure the honey.

Even a comparatively low temperature will injure honey, if the heat is kept up long enough. Take a temperature as low as 130 degrees Fahrenheit—one can hold one's finger in water heated to such temperature for several minutes. Here is a simple experiment that anyone can perform to show the danger of long continued heat, even at a low temperature. Heat a gallon of honey to 130 degrees and arrange the gas burner so that this temperature will just be maintained. Every twenty-four hours pour off a two or three ounce sample. At the end of a week, you will have honey ranging all the way from the original color of the sample, which stays water-white, to amber, the color of the honey that has been kept at 130 degrees for a week. It is the continued heat that injures the delicate flavor of the honey and darkens it from the beautiful color of the original. When you heat, therefore, take every care to prevent the maintenance of the heat, for the long continued heat injures the product. Honey is one of the most delicate of all foods and it deserves the very best handling.

PREPARING HONEY FOR MARKET

(C. Swanson, Hamilton, Illinois)

Most agricultural products take a generally set price. The price may be f. o. b. Chicago, or some other point, but for all of the same kind of product delivered at that point, the price is uniform. There are, of course, many exceptions of premium stock etc., but as a rule the prices of agricultural products are uniform and fixed.

It is altogether different with honey. A beekeeper, whether he be a side-liner or an extensive full-time beekeeper, will find that some of his neighboring beekeepers are selling their honey at a much less price than he, and perhaps some of his neighbors are selling at a higher price than his own. With honey there is a great range of prices. Just why should there be such a range? First, perhaps this difference is caused by the beekeeper or honey seller more than any other person. The second reason perhaps is the kind of honey and the market for that same grade of honey. The third is probably the type of package.

It is astonishing to learn of the number of beekeepers who have honey for sale and cannot find a market for it. These are usually the small side-line beekeepers as they will sacrifice their crop of honey in order to move it quickly rather than to hold it a few months and get a much better price for it. I believe all the reasons given above for the range of price are in effect here.

There is at present an inclination and perhaps one that is justified, that the larger distributors should handle all of the honey. In this way they can to a large extent control its price and make beekeeping profitable for the beekeepers. We will all agree that beekeepers, as a rule, really do not know how to sell honey, and if one or two beekeepers in a community, even if they have a very small amount of honey, sell at a low price, it has a bad effect on the other beekeepers who try to obtain a reasonable price for their honey.

Much can be said on both sides of the question as to whether honey should be distributed by the producer or by the regular honey dealer. Perhaps both have their place and perhaps the system is as good now as it would be were either one alone to have the distribution of honey.

But to come back to honey markets there is a great market for honey. Why is it then that there are so many beekeepers who feel that there is no market available?

Here is the situation. Several beekeepers have honey to sell. They live in or near a city or town in which people live who want honey. One fall and winter when honey seemed to be a drug on

the market the American Bee Journal tried an experiment to see whether the people wished to buy honey or not. There are a number of beekeepers around Hamilton. Wherever one man has a large number of bees you may be sure that there will be other beekeepers with greater or less number of bees as it seems that beekeeping begets beekeeping. In view of the fact that there are a number of producers of honey around Hamilton, Illinois, and Keokuk, Iowa, we conducted our experiment there. The population of Keokuk is about fifteen thousand and our results were rather disappointing yet at the same time they were enlightening, because it showed that a great many beekeepers could have sold their entire crop as we sold six thousand pounds in Keokuk at a good price. This was during about two months, about one week of work was spent in actually pushing the sales with occasional follow-ups during the next two months.

It occurs to most of us that the lack of market and selling is due to four things, as follows: First, inaccessibility; second, undesirable product; third, undesirable and unattractive package; fourth, price.

Inaccessibility is perhaps the greatest drawback. This covers the fact that the beekeeper lives in the country away from the thickly settled districts and someone, either the customer or the beekeeper, must transport the honey to the town. This is no drawback to speak of if it were combatted, but existing as it does, it cuts down the sales to some extent. We believe the best formation against such inaccessibility is advertising, sales through stores and the regular channels of trade, sales and displays in open market, sales to hotels, restaurants and other places where food is sold.

Number two in the lack of market is our undesirable product. By this we mean a poor grade of honey. The cause of this honey being of inferior grade is perhaps the source of the honey, its unripe condition or wrong handling of honey.

When the source of the honey is the cause of its poor grade, either dark in color or perhaps a flavor which is not desired by your customers, perhaps blending a small amount of this honey with some other honey which has qualities that counteract the poor honey, will make it a marketable product. If you do not care to do this, there is always an outlet for such honey to bakers, syrup manufacturers and such commercial users.

If your honey is unripe, then evaporation would be the best way to handle it. Honey may be evaporated by placing it in open containers and raising the temperature of the honey up to about 100 to 130 degrees. Surplus moisture is forced out of the honey by stirring occasionally and maintaining this heat.

Another cause of poor honey is improper handling. This has come to our notice forcibly during the past three or four years. We know of one beekeeper who as a rule has stored his honey in a cellar. Dampness and lack of ventilation caused this honey to

absorb moisture and this fine honey began to ferment when the warm weather of 1928 began. After it was evaporated, the quality was somewhat impaired and, of course, sold at a much lower price than it should. Another case is of a lot of honey with which we came into contact. This honey was a very nice color, but the flavor was questionable and we put this to the supposition that too much smoke was used in taking off the supers. The honey seemed to have a smoky taste and while we are not sure that this was the cause, we feel that such improper handling would give to the honey a flavor which would not be desirable.

Our third reason for a poor market and low sales was the undesirable and unattractive packages. By this we mean rusty, soiled, dirty tin cans, soiled labels, or perhaps a very clean, neat container but of the wrong size for that particular community. The average grocer does not try to sell a customer coffee when the customer wishes to buy butter. Perhaps this is a rather strong comparison, but when the community around the beekeeper and from which the beekeeper derives his customers, demands comb honey or extracted honey in glass jars, the beekeeper will do well to cater to this trade, instead of demanding, no matter how much he is in the right, that his customers buy their honey in larger tin pails.

There is no need to dwell on the soiled labels, or rusty cans. You are all familiar with these and how some other beekeeper's lack of attention to these lesser qualities of his product caused a slump in the honey sales including your own. The other thing to bring out is granulated honey. If your honey is bottled when hot it will not granulate for some little time. Do not overload your dealer, but replenish his stock when necessary. In this way you can keep freshly liquefied honey on his shelves and rid yourself of the granulation demon. Along with the undesirable package come sections which have not been scraped or cleaned. However, this is much less in evidence among beekeepers especially those who would take enough interest in beekeeping to come to Springfield.

Our point number four was the price. A few minutes ago I mentioned that there was a wide range in prices. When it comes to price I believe I can see several sides to the question. I would not like to see honey priced so high that the average customer in the grocery store could not buy it without a feeling that he had overstepped his grocery allowance. I can realize that very easily. Then again I would not like to see honey sell at a price where the beekeeper is not making a nice margin. I have a few bees of my own and I can realize that point too. While it would be impractical to mention a price at which honey should sell, we believe that the Illinois honey producers should obtain at least 10c per pound at what we might call factory prices. In other words, in selling the honey, why not have the honey producing as a separate occupation

and term it the factory. Then put selling altogether and term it sales. When the cost of honey is computed you should take the price for which you could sell your honey wholesale and charge your sales this amount. Then credit your sales for the money received for the honey and the difference would, of course, be the cost of selling and the profit. While this probably would not be practical, it is a good thing to keep in mind when you buy honey for reselling when your own crop is gone.

Every beekeeper has his own way of liquefying and bottling honey. There are equipments which can be secured at prices ranging from practically nothing to thousands of dollars. We wish to mention, however, a system which might work out for anyone who has no preparation for handling honey in heating and bottling it.

The first step, of course, is to have your honey in containers in which the honey can be liquefied. Sixty pound or five gallon cans are very nice for this purpose. Should your honey be in barrels, we believe the best way would be for you to take the head out of the barrel, put the granulated honey in pails for liquefying. We have liquefied honey in barrels but find that it is unprofitable. The head can be replaced and with a little care taken in opening and replacing the head, the barrel will be as tight as before.

With honey in five gallon cans heat is applied in two principal ways, one by hot water and the other by hot air. If anyone having a supply of granulated honey had brought it to this convention they could have taken it back thoroughly liquefied. The hot water heating is perhaps the most simple. A tank or vessel of some kind is set up in the honey melting room. A wood rack is placed on the bottom of this tank and the cans placed on this rack. Water is turned in, bringing it up two-thirds or three-fourths of the way on the cans. The water is heated by means of a stove underneath the tank or by steam pipes into the water. The reason for the wood rack is to allow water to circulate at the bottom of the cans preventing scorching. Care should be taken in heating this honey, making sure that the temperature does not go too high. 140 degrees should be the maximum.

The honey is heated until it is thoroughly liquid and brought up to 140 degrees. It is usually customary in this country to bring the honey up to a little higher temperature than this, then the honey is poured from these sixty pound cans into a larger tank thus allowing the air bubbles and any foreign matter which might be in the honey to rise to the top. The honey is drawn out by means of a faucet at the bottom of the tank into the containers which oftentimes are arranged on the scales so that as soon as the necessary weight is in the cans or containers the scale rises and the faucet can be closed.

Honey should never at any time be stored in a damp place as you all know that honey absorbs moisture and, if it becomes diluted by moisture being absorbed, fermentation takes place which causes a loss of honey and a lowering of quality.

We believe the greatest caution to use is in heating the honey. Recently a great deal of dissatisfaction occurred in sending honey to Germany when this honey had been heated. Prices have been lowered by the German merchants who received this honey because of this fact. There is a ruling now that honey exported to Germany shall not have been heated over 140 degrees Fahrenheit. This is because the honey should retain in active form the enzyme which might be injured in heating the honey over 140 degrees. The enzyme in evidence in honey is called diastase and the purpose of this enzyme is to convert starches into sugars.

One thing which I feel is of great importance to beekeepers and which is oftentimes overlooked, is that when they have sold their own crop of honey, they so often stop and allow their community to go honeyless until they have their own crop ready to sell the next season. Consider the advisability of buying honey and selling it again after your own crop has been exhausted. There are two reasons for this; one of them is that you make a nice profit in handling honey in this way and the other is that you keep your honey trade supplied and keep your customers until your next crop is ready. In this way your number of customers does not diminish and you can dispose of larger amounts each year as you will gradually add new customers and perhaps add more colonies to your apiaries, making it an entirely satisfactory and profitable proposition for you.

THE USE OF HONEY IN ICE CREAM

(P. H. Tracy,* Dairy Department, University of Illinois, Urbana, Illinois)

Ice cream is composed of a combination of cream, milk, condensed milk, sugar and flavoring material, with or without the addition of gelatin or eggs. Practically all states have laws regulating the composition of the ice cream as well as the manner in which it shall be processed and dispensed.

Ice cream owes its palatability, to a great extent, to its sugar content. The amount of sugar used varies from 12 to 18 per cent, depending somewhat upon the kind of ice cream and the section of the country in which it is manufactured. More sugar is ordinarily used in chocolate, caramel or butterscotch ice cream than in vanilla. Eastern manufacturers use from 2 to 3 per cent more sugar than do most of the manufacturers located in the central states.

According to a survey recently conducted by the National Association of Ice Cream Manufacturers, 77.5 per cent of the sugar used in the United States in ice cream is cane sugar, whereas 8.1 per cent is beet, 2.1 per cent is corn, 0.1 per cent is invert and 12.2 per cent is contained in the condensed milk used in preparing the ice cream mix. Cane or beet sugar is ordinarily considered as the main source of sweetness. Corn sugar can be used to advantage when its price is sufficiently low. Being only about 70 per cent as sweet as cane or beet sugar (sucrose) corn or dextrose sugar is sometimes used to replace a part of these sugars, thereby introducing into the mix more solids than it would be possible to have in case the same sweetness was obtained entirely from the sucrose.

Invert syrup is a product that was used rather extensively during the war when the government placed a limit upon the amount of cane or beet sugar that could be used in ice cream. It is prepared by heating either cane or beet sugar, dissolved in water, to a high temperature in the presence of an acid. Professor H. A. Ruehe of the Dairy Department proposed the following formula for making invert syrup:

100 pounds of sugar
44 pounds of water
50 grams of powdered tartaric acid

These ingredients are mixed together and boiled for 30-35 minutes. As a result of this treatment the sugar is broken down to dextrose and levulose. The dextrose is only about 70 per cent

* F. P. Sanmann of the Dairy Department assisted in this investigation.

as sweet as sugar but levulose is 164 per cent as sweet, so when using the above formula the sweetening powers of the sugar are increased. Invert sugar syrup is not used extensively in ice cream at the present time, due to the relative cheapness of cane or beet sugar.

At the University of Illinois a study has been begun on the possibilities of using extracted honey as a source of sweetness and flavor in ice cream. Honey contains the two sugars, dextrose and levulose, and chemically is similar to the invert sugar syrup described above. While in the honey sack of the bees, sucrose, which forms the chief constituent of nectar, becomes for the most part inverted, forming dextrose and levulose. In addition, honey contains enzymes such as invertase or sucrase, diastase and sometimes inulase and catalase. Certain aromatic compounds are present which give to the honey its characteristic flavor and odor. Other substances such as wax and certain foreign matter may be present in variable amounts.

A series of experiments have been performed in which we have studied the merits of honey from the standpoint of its effect upon the freezing process, the flavor and body of the ice cream and its keeping quality while held at low temperatures for a period of time. We have also compared thirteen different flavored honeys from the standpoint of the desirability of the flavor in ice cream. A general summary of our study to date may be of interest.

Total solids determinations on three lots of honey were 82.34, 76.65 and 78.9 per cent respectively; whereas the sweetness was found to be about 70 per cent of that of sugar. Being a mixture of dextrose and levulose, honey has a greater depression on the freezing point of the ice cream than does sugar when the two are compared on a total solids basis. Mixes containing honey do not freeze quite so rapidly as do the sugar mixes.

Honey not having as great a sweetening power as sugar must be used in greater proportion. It was necessary to use about 18 per cent of the honey to give a sweetness comparable to that of a mix containing 14 per cent cane sugar. When used in these proportions there was little difference in the body of the ice cream.

The flavor of the ice cream varied. It was found that when as much as 20 per cent of honey was added the ice cream usually acquired a waxy flavor; whereas that containing 16 to 18 per cent was desirable. Combining sugar and honey did not produce as nearly as satisfactory a flavor as did using either the sugar or the honey alone. In one series the ice creams which contained both sugar and honey developed a very undesirable stale flavor in storage; whereas none of the ice creams containing sugar or a limited amount of honey alone, developed the stale flavor. This flavor was thought to be due possibly to the presence of beeswax. In another series, similar combinations of sugar and honey did not

produce the stale flavor. The honey used in this series contained only small amounts of the wax. It was also true that the flavor of the all-honey ice cream of this series was much better than the all-honey ice cream of the first series.

Some city ordinances require that the entire ice cream mix be pasteurized by heating to a temperature of 145°F. or higher and holding at that temperature for thirty minutes. We did not find such treatment to have any detrimental effect upon the honey flavor, although it did tend to produce a slightly more pronounced flavor in the ice cream. Heating the mix tends to cause the wax to melt and come to the top and as the temperature increases this wax, instead of being dispersed throughout the mix, grows into larger globules.

Various flavor combinations were tried with the all-honey ice creams. Vanilla extract does not blend well with the honey flavor. Chocolate tends to cover up the honey flavor. Pineapple was found to blend very well with the honey. Cherry, peach, tutti-fruitti and mint were also found quite satisfactory. The strawberry fruit flavor does not blend so well as does some of the others. One of the best combinations we found was a bisque made with grapenuts.

Comparison of the ice creams flavored with different honeys gave some very interesting results. The following table shows the placings of five judges on 13 different lots of ice cream, each containing a different honey. Eighteen per cent of honey was added in each case.

Comparsion of Different Honeys in Ice Cream

Sample	Rating*	Placing				
		Judge No. 1	Judge No. 2	Judge No. 3	Judge No. 4	Judge No. 5
Dadant No. 1—White Clover	41	6th	6th	6th	6th	5th
Dadant No. 2—Sweet Clover	63	1st	2nd	2nd	1st	1st
Orange	40	5th	5th	5th	8th	7th
Tupelo	30	7th	8th	9th	9th	8th
Heartsease	21	9th	10th	11th	10th	9th
Buckwheat	15	12th	12th	9th	11th	11th
Alfalfa	58	4th	1st	3rd	2nd	2nd
Sage	29	8th	9th	7th	7th	10th
Cotton	5	13th	13th	13th	13th	13th
Basswood	52	3rd	4th	4th	3rd	4th
Clover & Heartsease mixed	33	10th	7th	10th	4th	6th
Palmetto	12	11th	11th	12th	12th	12th
Clover	56	2nd	3rd	1st	5th	3rd

*Maximum rating possible—65.
Minimum rating possible— 5.

The clover and Dadant No. 2 ice creams seemed to be the most popular with the judges. The Cotton sample was placed last in each case, it having a fermented flavor. Buckwheat gave the ice cream a coffee color and a peculiar flavor somewhat similar to maple or sorghum. The Basswood honey had a mint flavor which was very noticeable in the ice cream. The flavor on the Palmetto and the Heartsease lots were both rather pungent and undesirable. Tupelo and Sage were about on a par and were considered by most judges as neither the best nor the poorest of the samples.

The sweetness of these ice creams did not vary a great deal and was comparable to the control samples which contained 14 per cent sugar.

Conclusions

From the data obtained so far the following conclusions may be drawn in regard to the use of honey in ice cream:

1. Honey can be satisfactorily used to replace the sugar in ice cream for the purpose of creating a new variety.
2. When replacing sugar with honey, about 25 per cent more of the honey should be used than sugar. From 16 to 18 per cent of honey is recommended.
3. Honey should not be used in combination with sugar as a better flavored ice cream is obtained when the honey is used alone.
4. Honey can be used in combination with most flavors ordinarily used in ice cream, excepting vanilla. Honey serves a dual purpose inasmuch as it flavors as well as sweetens the ice cream.
5. Different flavored honeys can be used to advantage. Of the ones studied, Alfalfa, Clover and Basswood honeys seem the most popular with the judges.
6. There exists a difference in the quality of the ice cream made from different honeys, due to conditions other than differences in variety of honey. Of considerable importance in this respect is the presence of wax and a fermented condition of the honey.

Possibilities of the Use of Honey in Ice Cream

Approximately 1,500,000,000 pounds of ice cream are consumed in the United States in one year's time. This represents a sugar consumption of about 200,000,000 pounds. According to a survey made by the National Association of Ice Cream Manufacturers, 55.48 per cent of the ice cream sold is vanilla, 10.06 per cent is chocolate and 7.82 per cent is strawberry, leaving 26.64 per cent for the various other flavors such as cherry, maple, peach, pineapple, etc. Coffee ice cream represents 2.26 per cent of the total manufactured. If the consuming public can be prevailed upon to take over 2 per cent of their ice cream flavored with coffee, surely they can be persuaded to buy at least as much honey ice cream. Sup-

posing such an amount of honey ice cream was to be sold each year, this would represent a consumption of about 5.5 million pounds of extracted honey.

From a cost standpoint, honey compares very well with sugar. Assuming 14 pounds of sugar as the amount needed to sweeten 100 pounds of mix, the cost would be 84 cents. The amount of good vanilla extract required to flavor this amount of mix would cost about 50 cents, making a total cost of $1.34. To sweeten and flavor the same amount of this mix would require 18 pounds of honey costing $1.44, assuming a price of 8 cents per pound for the honey. The difference would amount to about one-half cent per gallon of ice cream. As compared with fruit ice creams the honey ice cream would be much cheaper. Fruits vary in price but will average about $2.00 per hundred pounds of mix, making a total cost for sugar and fruit of about $2.84 as compared with $1.44 for the honey.

By using a variety of the different flavored honeys several different flavored ice creams could be marketed. In this way a wider appeal could be made so that the consumer could buy ice cream sweetened and flavored with his favorite honey.

Too much emphasis cannot be placed upon the fact that if honey is to be successfully used in ice cream it must be of uniformily high quality. It should not vary in composition or flavor; should be free from wax and foreign matter; and should not be fermented. If honey producers are in a position to supply ice cream manufacturers with a high quality product at all times, then it seems that an opportunity awaits them in the dairy field.

Acknowledgments

Acknowledgment is due Mr. M. G. Dadant for suggesting this problem and for the supplying of the bulk of the honey used. Credit should also be given to Professor V. G. Milum of the Entomology Department for his kind cooperation and to Hoffman and Hauck, Inc., Ozone Park, New York, for the samples of honey they submitted for this study.

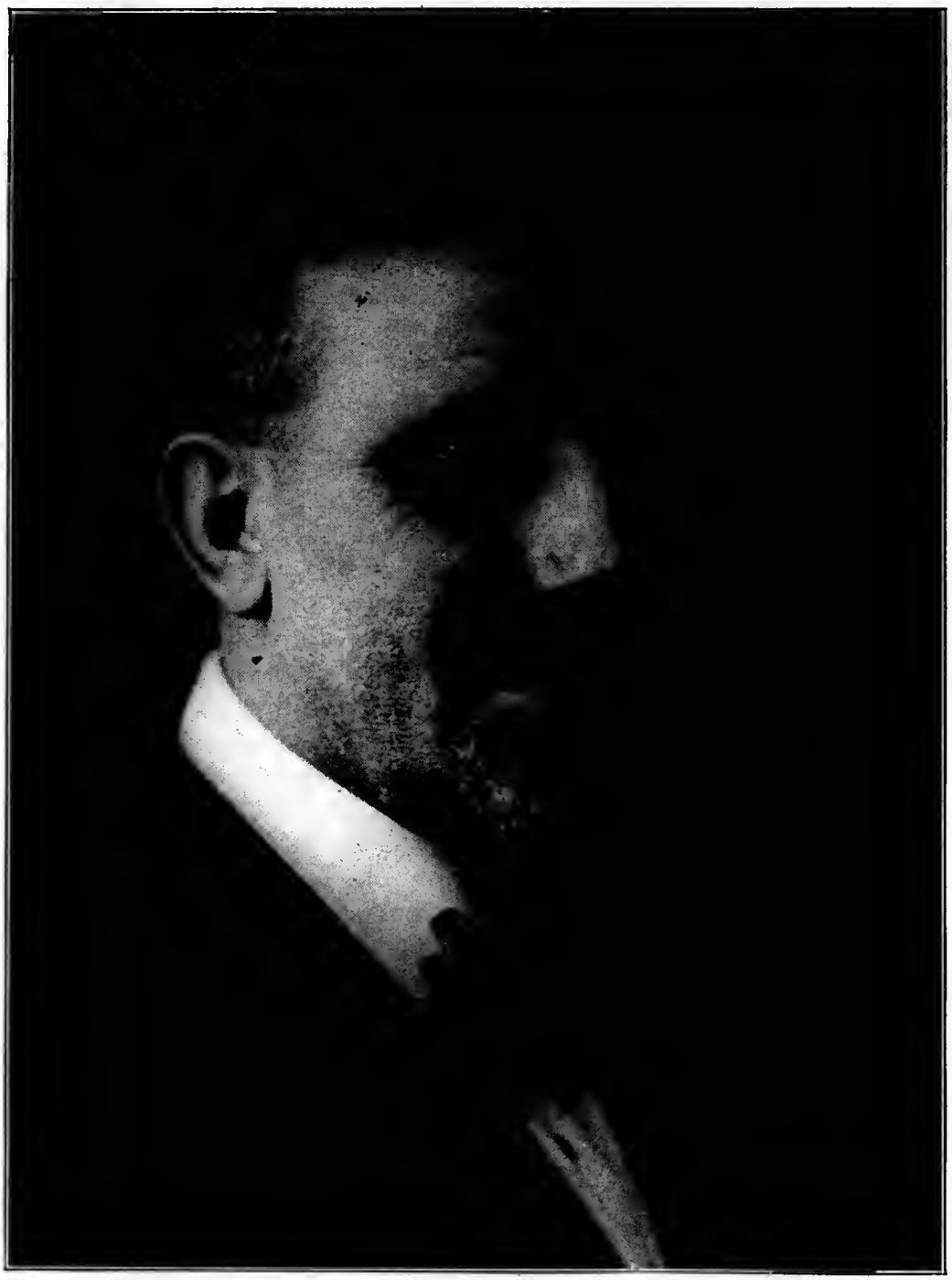
THE AMERICAN HONEY INSTITUTE AND ITS WORK

(H. E. Barnard, Indianapolis, Indiana)

It has been my pleasure during the past several months to have attended a number of Beekeepers' Conventions and to have listened in these meetings to discussions of the problems of honey production. Wherever I have met beekeepers I have enjoyed their discussions and noted with surprise the completeness of the information they have concerning beekeeping problems. In my talks at these meetings I have allowed my colleagues on the program to handle production problems and devoted myself to matters having to do with the distribution and sale of the honey crop. That, as I see it, is the work of American Honey Institute, and in my talk this afternoon I shall endeavor to show you how the Institute is operating in the interest of beekeepers everywhere. Our Institute is a new idea, developed by the Bee Industries Association of America, and crystallized last spring into a definite organization incorporated under the laws of Indiana for the purpose of promoting a larger interest in honey and its use. In the months since American Honey Institute was organized, it has developed nation-wide contacts with many interests and agencies which are concerned with the sale of honey and its use in the dietary. We have been in touch with the Federal and State Food Officials who enforce the pure food laws and who are as much concerned as we are in requiring foods sold under the honey brand to be made with honey. We have been in correspondence with the Divisions of Markets of all of the States for the purpose of stimulating the interest of these state officials in a more profitable sale of honey. Home economic teachers in the Universities and Schools of Domestic Science have had their interest reawakened in the value of honey in the dietary through the Institute. The Baking industry, through its trade journals and by correspondence with leading bakers is appreciating as never before the desirability of honey in making quality baked goods.

The Institute has made progress in developing plans for securing a special appropriation to be used by the Scientific Bureaus of the United States Department of Agriculture in conducting research on many honey problems. And so in many ways the Institute has endeavored to awaken an interest in honey which has remained dormant through all the years other sugars have found an increasing use. The honey market has been neglected and honey has become an occasional item in the warehouse of the wholesaler and on the shelves of retail grocers.

Of course there is no honey market until the honey is on the table. It does no good to talk about getting honey into the hands of the wholesaler unless you know he is going to put the product



DR. H. E. BARNARD, INDIANAPOLIS, INDIANA
President of American Honey Institute

before the consumer. In other words, our problem is that of interesting people in eating more honey, and that is a difficult problem because in the past fifty years there has been a tremendous increase in the consumption of sugars, and since the capacity of the

human stomach to utilize food is limited, if that stomach is filled with sugars other than honey, less honey will be used.

Our problem then though difficult to solve is simple enough to define. It is to find a way by which the 110 pounds of sugar which is used annually by everybody on this continent is made up in a larger part of honey. In the United States, of the 110 pounds of sugar consumed, about 109 pounds is in some other form than honey. About one pound of that tremendous quantity of sugar food is honey and that is not nearly enough. If we can increase the consumption of honey in the sugar diet even by a little bit it will mean a great deal to the consumer Sugar consumption has increased from 60 pounds twenty-five or thirty years ago to its present high figure. That fact of itself shows our problem to be a difficult one to solve, because we have to push off the table a food which has become accepted and used in very large quantities.

It is very interesting to note how in the last few years the Canning Industry has grown. It has been developed because there is a profit for the canner, of course, but he has used all sorts of methods for increasing the consumption of his products. In the first place some twenty years ago canners established laboratories to study canned goods. They had problems to solve which were technical in character which could not be handled at the canning factory. The first problem which they had to take care of was that of standardizing the product. Years ago, canned peas were just canned peas,—any kind of peas in any kind of a can. At the present time the pea pack is so well standardized that when the housewife buys a can of peas under a definite designation she knows exactly what she is getting. The same thing is true of tomatoes, and of practically all other canned goods. In other words canning is a standardized industry; and it uses an enormous quantity of sugar.

Whenever a housewife puts on the table canned foods put up in sugar syrup she satisfies the sugar hunger of her family to a very considerable degree. So the beekeeper may well realize that the California Fruit Packers' Association that puts up peaches, pears or apricots in sugar syrup, is making it impossible for the beekeeper to find as large a market for his honey as he would otherwise. And what I have said in reference to the canning industry is true of every other commodity.

How much sugar do you suppose is made into condensed milk which goes into the kitchen pantries and ultimately on the tables of our country? Thousands of tons of sugar are used by the Dairy Industry in preparing condensed milk.

How much sugar do you suppose the baking industry is using in manufacturing its sweet goods? At least 200,000,000 pounds, or as much as our annual honey crop.

So you see the difficulty we are up against is in putting honey back onto the table from which it has been pushed aside by these rather new uses for sugar.

But the situation is not so difficult after all, if we once get the proper picture of it; and the picture of honey, for me, is simply that of a most desirable food into which is mingled the background provided by the honeybee working among the flowers and the blossoms in the orchard, bringing to the home a sort of sentiment and a form of poetry which is absent from most of our other foods. There is nothing very poetic about a loaf of bread; it is mighty good food and that is just about all we can say about it, although our thoughts still go back to the days when Mother used to make home-made bread in the kitchen and we can remember how good it used to smell when brought out of the oven.

But there is a whole lot of poetry in Honey, and I believe that the way to approach our subject is to take some of that poetry which surrounds our business and put it into the consciousness of the housewife and of the members of her family. That can be done by advertising. It can be much better done, I believe, by telling the story in the form of newspaper articles, editorials, by constant and continual reference to the fact that we have been forgetting Honey too long and that it ought to come back in a much larger way as a part of our regular, steady, every-day diet.

The grocer sells the goods for which his customers call. He is not interested in selling any particular item; if he can make a profit on it he is just as willing to sell a broom as he is to sell a jar of honey. A grocer cannot be expected to push the sale of any article unless there is a profit in it for him; and he is not very much interested in stocking his shelves with products unless he knows his consumers are going to take them off his shelves very quickly. So the only way we can help the grocer is by stimulating the demand for the product.

As you know, the first necessity is a uniform and standardized product; and that is a technical matter which has to be handled by the beekeepers through their jobbers, through their cooperatives, by any means which will bring together large stocks of honey, so that it will then be possible to make blends which are uniform and standard, so that when a housewife gets accustomed to buying honey and learns to love its flavor she will know that the next time she buys Honey she is going to get something which is very similar, at least, to the other purchases she liked so much. That problem is one to be worked out by the industry, not so much by the individual beekeeper himself as by the jobber through whom his product goes to the market.

I feel that the wholesale grocery trade has lost interest in Honey chiefly because they have noted the rather small volume of business in comparison with the volume of business of other types

of syrups and sugars which they sell in increasingly large quantities. But we now note a tendency on the part of people to take more interest in the natural foods, in the common foods, and to get back to the homely odors, flavors and tastes which we used to know. There seems to be a stimulated interest in those foods, and it ought to react favorably toward a larger use of honey.

Take, for instance, the change in the habit of bread eating. There is a very considerable demand now for types of bread of the darker varieties, instead of the standardized white bread which has been so large a part of our bread consumption. That is due to a number of things, but it is due primarily to the fact that people are beginning to look upon food as something more than just food. It is due to the fact that we now have what is called the newer knowledge of nutrition, and people are eating now not alone because they are hungry and tired but because they know they have to eat in order to keep strong. And mothers are paying more attention to the food of their children than they have ever done before.

The National Dairy Council is an organization that is spending some millions of dollars a year in promoting the larger use of milk; and it has been very, very successful. A few years ago, a campaign to increase the use of milk among school children of Philadelphia stimulated such a demand that the retail milk consumption went up nearly fifty per cent. When a child is taught in school that he ought to have his pint of milk a day, he goes home and tells his mother what his teacher says.

Is there any reason why the thousands of teachers of Home Economics in this country, the women in our schools who are telling the children what is good for them, should not have a better appreciation of the value of Honey as a food than they have at the present time? Is there any better place where we can begin to tell our story of Honey more successfully than among these teachers who are developing the food habits and directing the food interest of the children in the schools? We cannot get away from the fact that the person who can do the most good for us in changing food habits is the teacher in the school.

We have a tremendous crop coming along in this country, the most valuable of all the crops we grow, and that is our crop of children; they have to be well fed, and have to have plenty of energy food. When they come home after a hard day's work at school they are always hungry, and it is not right for them to go from three o'clock in the afternoon until six o'clock in the evening without something to eat. They need energy food, and the best energy food that can be given them is sugar, the right kind of sugar, because sugar is immediately transformed or metabolized so, that within five minutes after eating it, they can go on with their play or their work, invigorated and refreshed.

I suppose most of the schools of Illinois are providing the children with a mid-morning lunch. Within the last ten years that has become an almost universal practice in the United States. A hearty breakfast is almost better for the child who wants to learn than good teaching; because a teacher cannot put much into a child's head if the child has an empty stomach; so the practice of feeding the children in the morning recess a glass of milk with a cracker or a cookie is becoming very general. Now if we can supplement that practice, which is approved by every one, by seeing to it that the children when they come home from school have every right in the world to run into the kitchen and get their mid-afternoon meal, we know that those children will be better fed; and, as I have just pointed out, we will have made use of the best method in the world for getting a Honey appetite established in every home in which there are children.

There are other ways in which you can reach into the homes with the suggestion that the children should be given more honey, and one way is through the daily newspapers, through the magazines which are read by women, and through all of the home papers.

I have been engaged for many years in publicity and during the years I was a food official enforcing the Pure Food Laws I found I could correct unsatisfactory conditions a lot more quickly by telling about the conditions through the newspapers than I could by haling an offender into the police court. I know that editors want interesting copy to fill up their columns; they do not like to work hard any better than anybody else does and if they can have their work prepared for them they will use it. Of course they will not carry material in their news columns which ought to be in their advertising columns. But somehow there is something about Honey which makes a good story. Some very interesting papers are sent me by beekeepers throughout the Western States. I recall particularly a little country newspaper which comes to me from Nebraska which every week carries a very interesting story of Honey. That story is sent to a local paper by a beekeeper who happens to be the Secretary of the Nebraska Beekeepers' Association and who has the idea that while taking care of the bees he should also take care of the local editor; and so this column week after week is telling an interesting honey story. You can be very sure that the readers of that newspaper consume a great deal more honey than they would if they did not have that story constantly before them.

There is a movement on foot to displace the Hot Dog stand with a better type of refreshment stand, where the traveling public may get better food, something which they like better and something which is better for them than the cheap foods which are prepared for them by men who have not the slightest idea about sanitation or about nutrition. And so the Tea Room is coming into existence under the elms or the apple trees by the side of the road,—

good places for good food for the traveling public. It seems to me that if we can get Honey consciousness across to the Tea Room operators we will do a good deal for the honey producers, we will do a lot for the market and we will do a lot of splendid advertising.

I was in New Hampshire recently at a meeting of beekeepers and I found that almost all the honey produced in that State, which is merely as a sideline to fruit growing, is sold by roadside stands. And I have no doubt that a large part of your crop is sold in that way. I am very certain, and I think all of you will agree with me, that if we can make honey one of the staple articles of food along the highways all through the country, we will not only increase the sale of honey but we will get honey back into the food supplies of a great many people who have forgotten all about it.

Tourists are looking for different things, and Honey and Hot Biscuits—whether we want to believe it or not—are a rather unusual food combination for a great percentage of our population; and we have got to make it the usual thing.

I have not referred to the possibility of approaching our friends, the nutrition experts. Those to whom we have to go are our doctors, our dentists and our nurses, who have forgotten all about honey, but who never fail, when honey is mentioned, to remember their boyhood and their girlhood days. I have found that the dentist is a very helpful man because he is talking about tooth structure to mothers all the time. The dentist is beginning to realize that the nutrition of the child determines the character of its teeth. We have not time here to go into that. But if we can get mothers to give their children honey instead of white sugar, we will be giving them something which is a great deal better for tooth structure than the tremendous quantity of sugar which they are now using.

I am showing you some of the paths down which I think you may travel to an increased consumption of Honey. And may I tell you that if the American Honey Institute can do anything to help you, in the way of directing scientific research along the lines which must be studied if we are to learn all we ought to know about honey, will you not let us help you?

I said in the beginning that our problem was a simple one; that all we have to do is to find a way by which a much larger part of the 110 pounds of sugar consumed annually is Honey, and I have pointed out how a Honey consciousness can be awakened in the children who gather three times a day around the table in more than twenty million American homes. If American Honey Institute, with your cooperation and with the help of beekeepers everywhere can satisfy the craving for sweet energy foods with the fragrant product of your hives, the purpose for which it was founded will have been fulfilled.

ILLINOIS' FUTURE IN HONEY PRODUCTION

(M. G. Dadant, Hamilton, Illinois)

Changes come rapidly in many professions, and beekeeping may not be considered an exception. The writer is not interested in chronologically giving a series of events in the past which have influenced the progress of beekeeping in general and Illinois in particular, but more in depicting specifically some of the changes which have occurred in honey flora in Illinois. Also changes which are taking place now, and the effect they may have on the future of beekeeping of our state.

In the first place, our state is a long one so that we have within its bounds conditions of a snow bound northern winter, and climatic conditions in its southern extremities not unlike our more southern states.

Topographically, however, from north to south it is much the same, a rolling country with much fine flat farming land interspersed with many creeks, rivers and their valleys. In such a country, beekeeping ordinarily reaches its highest honey resource possibilities relatively early. Illinois has not been an exception as a search of the census will show. Our period of highest productivity in honey seems to have been in that period from 1880 to 1900. While our honey values have risen since, it has only been because of better types of beekeeping, and of better prices for our products and not because of any increase of our natural honey resources.

Let us examine the reasons. First, the forests. More of them thirty to forty years ago. As a consequence, more early bloomers for pollen such as maple, willow and elm. Also more surplus producers such as locust and basswood. Many a beekeper can recall an early basswood flavor in his honey which of late years has disappeared. It is to be hoped that the sentiment which is now rapidly developing towards conservation of natural resources, and reforestation may in time again clothe some of our naked hillsides subject to all of the ills of erosion, back in their native timber of which the honey producing trees will be a part.

Turn to the rolling hills. Forty years ago almost altogether pasture land, where now in many instances unprofitable tilling is carried on. A general reduction in pasture area means a reduction in white clover acreage.

And the prairies. Earlier many were undrained. In a wet season, an ideal place for the heartsease and spanish needle. In my own time I can recall wonderful fall pasturage where now are only fertile fields and abandoned apiary sites.

Added to all this is the fact that gradually Illinois' soil has used its relatively small available supply of limestone in the top soil through crop harvests with little attempt at replacement. This applies to all of Illinois except that small portion in the north which was favored by lying within the old Wisconsin glaciers which were rich in limestone deposits. Many of our central and southern Illinois locations though underlaid with limestone beds have the top soil acid, and very much so. And acid soil means that lime loving plants like the clovers may still survive, they do survive and yield bounteous crops in sufficiently moist years; but they suffer and burn out in unusually dry summers. And the recuperation period seems to be longer as the soil becomes more acid.

A prominent government official gave it as his opinion a few years ago, that Illinois as a honey state, was not to be seriously considered, and her status would never be any better. A rash statement for anyone to make, and made without due consideration of the enormous volumes of honey produced in Illinois which never leave the confines of the state and many times the community in which it was produced.

My remarks have, so far, been confined to picturing the dark side of the honey picture in Illinois. Let us now consider the other side, which leads me to believe that Illinois is now entering on an era which is to make for her a name in beekeeping at least the equal of any of her neighboring states if not of any state.

In the first place, she still has the little Dutch white clover as her dower right, one of the heaviest of honey producers when conditions are favorable. Her white clover areas are increasing on account of the increase in dairying and consequent additional pasture required.

Alsike clover has taken its place in crop rotation for low lying, moist locations. And alsike is nearly the equal of white clover for honey possibilities with the added factor that soil acidity affects it much less.

Fruit growing is increasing rapidly in our state, especially in the west and south. And fruit growers in the last three years have learned the value of bees as pollinizers. Small orchards act only as a stimulant to the bees, but big commercial blocks yield surplus as was readily demonstrated by experiences in Michigan in 1928.

But the big factor is that the natural acidity of Illinois soil is being counter-acted, sweetness returned by the application of tons, cars, trainloads of limestone crushed fine and scattered one ton, two tons, three and even four tons to the acre according to reaction tests. Coincident with this has come the realization that one of the finest of soil builders and crop rotaters is the biennial sweet clover. It stops erosion, penetrates and breaks the sub soil, is a wonderful legume to plow under, and best of all is a honey producer.

Ten years ago, this was recognized, but only applicable to those sections like northern Illinois, with a naturally lime soil. Today the farmer carries sweetness to the sweet clover, that it may grow, where its acid handicaps were too great before.

In my own county, I can see the change coming, though its effect on the honey crop is still not pronounced. But I cannot gainsay my county agent's figures when he tells me that our county (Hancock) had only 100 acres of sweet clover in 1919, 500 in 1921, 1000 in 1923, 3,500 in 1926 and had a total of 4,500 in 1928. We are having to consider this honey source now in choosing our locations.

But be not too rosy. We cannot hope to approach the ideal nectar secretions possibilities of the northern countries with their long warm days and cool nights. Much of our sweet clover will be plowed under or cut without a bloom for the bees. But much will be left also for seed, and much be pastured and be blooming in the same field.

And the aggregate will be that we will find our conditions much improved. A moderate crop where we previously struggled with a failure. A little added boost to a light white clover year. And a prolongation of a bumper white clover crop.

In the meantime perhaps we might well look with profit to our choice of bee locations. Are we making the best of the later possibilities of our region? Things change with the years. Are we giving the bees the advantage of best honey crop locations? A mile's difference may mean success or failure.

RELATION OF FRUIT GROWERS AND BEEKEEPERS

(Frank C. Pellett, Hamilton, Illinois)

The honeybee is the finest example of cooperation in all the kingdom of nature. She is one of the few creatures which gives more than she takes. Neither animal nor plant must die in order that she may live and this is true of very few living animals.

By the distribution of the pollen to insure their proper fertilization she cooperates with the plants which spread the food upon which she depends. Likewise, within the hive, the cooperation of the various individuals composing the community makes it possible for them to prosper under conditions where, as individuals, they would quickly be lost.

A thousand worker bees cluster together to build the combs in which to store their honey and to rear their young. Likewise, when the harvest comes, the combined labor of the field bees piles up a store ample to carry the community safely through the long winter. By uniting in a common defense they drive off intruders who would rob them of their store; and clustering together they are able, by alternate periods of rest and labor to warm the hive by muscular activity and survive periods of cold which would be fatal to the individual alone.

Little by little we are coming to learn of the wonderful interplay of forces throughout the entire field of nature, and to comprehend some of the details of a marvelous relationship by which each is dependent upon another for something of fundamental service. Even where there is an apparent conflict at some point, there is a dependence at another. Fruit growers have long ago learned of the service which birds render in the destruction of insects, even while demanding their full share of the resulting fruit.

Of late they have come also to understand that the bees which visit their blossoms also render a valuable service. It has not been very long ago that there was some conflict between the beekeeper and the fruit grower because they failed to understand that their interests were mutual. There have even been suits at law because fruit growers accused the bees of injury to the fruit. It is true enough that bees will visit grapes which have cracked open and suck the juices, but we know now that the bees do not open the sound fruit, but come only where injury has already been done by weather, by birds or wasps. The mouth parts of the honeybee are soft and incapable of biting through the skin of a sound fruit. This has been proved by confining the bees to hives in which were placed bunches of grapes and no other food. The bees starved to death with the fruit still uninjured.

On one occasion I visited a large raisin grower in California who showed me a large quantity of raisins which had been damaged by an unexpected rain with the result that they cracked open and the bees sucked them dry, removing all the juices. Similar complaint has been made in the case of over-ripe peaches.

The fruit grower does not know that when the bees store fruit juices in the hive instead of honey, in cold regions the result may be very disastrous to the bees. With such stores present in the hive the bees are likely to die from dysentery during the winter months when they have no opportunity to leave the hive for a cleansing flight. Bees void their excrement normally only in flight. The loss thus may be much greater to the beekeeper than to the fruit grower, since it is only damaged fruit of little, if any value, which they are able to molest.

Fruit growers, of course, are familiar with the extensive experimental work which has been done of late in the study of pollination problems. The results have been so convincing that no well informed grower any longer questions the value of the bees in the orchard. Numerous cases have been published where previously unprofitable orchards had yielded heavy crops when bees were brought in at blooming time and provision made for intercrossing of varieties suited to each other. A short time ago, in visiting with an extensive orchardist, he told me of his experience with an orchard of fifty acres in Kansas. The orchard was a solid block of Jonathan with the exception of three Ben Davis and one seedling. Seeking a remedy for the light set of fruit he brought bees to the orchard with the result that he secured a good crop in that part of the orchard surrounding these four trees. The following year

he brought in bouquets of opening blooms from other orchards and set them in tubs here and there throughout the entire block. This time he secured a sufficiently large yield to convince him that his previous difficulty had been lack of pollination.

In the February, 1928, and January, 1929, issues of the American Bee Journal, Prof. H. D. Hootman of the Michigan Agricultural College gives accounts of similar work in Michigan. I need not go into detail here with work which is probably already quite familiar to fruit men. I may say in passing, however, that they were able to secure a remarkable increase in the yield of fruit by means of bees not only with apples, but with pears, peaches and cherries. In a block of J. H. Hale peaches which had previously yielded principally "buttons" from lack of pollination, they secured 1000 bushels of peaches from 400 trees when the bees were brought in. Last autumn at picking time I visited the McClay orchards at Hillview, Illinois, and found a big force of men gathering a great crop. There are more than 1200 acres of apples in the McClay orchards. With such an expanse, the wild bees and other insects that nature provides are very insufficient for the task. The crops had varied greatly from year to year until bees were brought in. McClay declared himself entirely satisfied after three years that the bees were a great asset to his business. One block of winesap that had not set a satisfactory crop previously, has yielded three good crops in succession since that time.

To secure satisfactory results in the pollination of the orchard two things are necessary—proximity of inter-fertile varieties and the presence of insects to distribute the pollen. If a solid block of self sterile variety is located by itself with no other variety near, the bees alone cannot solve the problem. Either a certain percentage of the trees must be top worked with other varieties or bouquets must be brought to the orchard at blossoming time. The result of this method in Michigan has brought such satisfactory results that it is very generally practiced in the neighborhoods where it has been tried. Topworking does not provide available blooms for immediate service and bouquets must serve in the meantime.

Heavy losses from failure to set fruit have resulted in the past through lack of knowledge on this point. There is still some work to be done in the study of variety affinities. In Michigan they discovered that Bartlett and Seckel pears which had been much planted together were inter-sterile and incapable of fertilizing each other. Once the fruit grower knows which varieties are best adapted to this purpose his problem is comparatively a simple one. By interplanting in new orchards and top-working of old ones he makes available a supply of pollen which the bees may be depended upon to distribute. Hootman, in the article already mentioned, tells of a case where in a single cherry orchard the yield was in-

creased by fifty tons which could be directly traced to the services of the bees.

We come now to the problem of maintaining the bees in the orchard. There are two difficulties here. In the first place modern orchard practice requires spraying of the trees to keep insect pests under control. The poison that kills the insect enemy will likewise destroy the insect friend. In the second place where orchards are grown in large acreage it often happens that there is little pasture for the bees after the fruit is set. Both these problems may be met by moving the bees and, in most cases, this practice seems best in large orchard areas.

I have visited several of the large orchard districts such as the Grand Valley of Colorado and the Pecos Valley of New Mexico. In many places the extensive honey producers have moved to other localities because of continued losses of bees from spraying. In the Grand Valley it is necessary to spray the trees as many as eight times during the season. It is therefore more or less of a continuous process and is, accordingly, very difficult to find any system by which it can be done effectively and still protect the bees. In the northern states the problem is simpler for the reason that spraying need not be done so often and, also, because of different climatic conditions the bees are less often killed by taking the poison as a source of water supply. In the dry southwest water is not so readily available. The bees use large quantities of water in brood rearing and, when spraying is done, they find moisture readily available on the leaves of the trees. There is additional loss through the drip of poison to the cover crop below. Alfalfa is much used as a cover crop in western orchards. When the bees visit the blossoms of the alfalfa, long after the fruit bloom has fallen, they are killed in large numbers. At Roswell, New Mexico, I found the most extensive beekeeper still remaining, getting permission to cut the cover crops in neighboring orchards at his own expense just in advance of spraying.

When we remember that there are three different times when the bees may be killed from spray in the southwest—from the fruit trees at blooming time, from watering from the leaves and from visiting the blossoms of the cover crop, we are not surprised that it has proved to be a difficult problem to maintain bees in the orchards.

In this region there is seldom complaint of losses except at time of blooming of the fruit trees. Where the orchardist uses care to apply the poison after the greater part of the petals have fallen the danger is not great. In some orchards with a number of varieties overlapping which prolong the blooming season over a long period, it is sometimes difficult to avoid some loss.

Where the bees are placed on a permanent apiary site with sufficient pasture to maintain them throughout the year, the cost

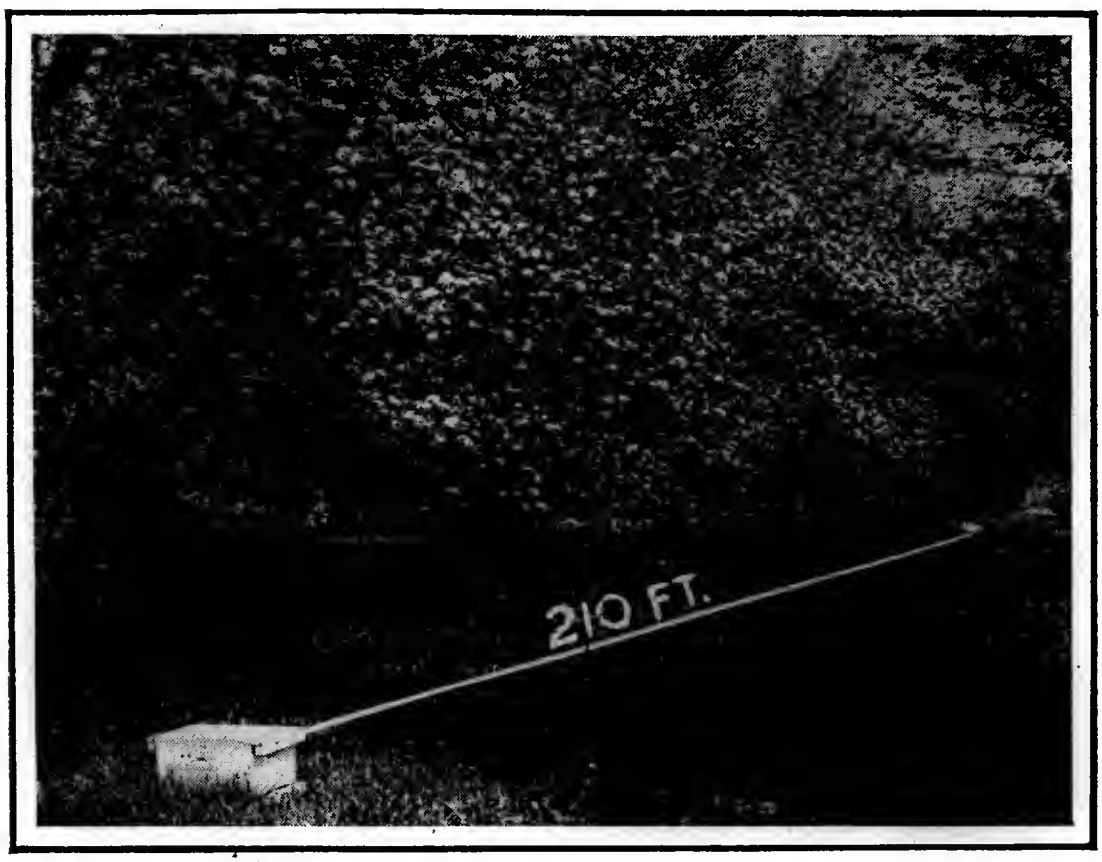
of handling can be greatly reduced. In large orchards, however, better results in pollination are secured by scattering the hives throughout the orchard. If a hive is set under every fourth or fifth tree in every fourth or fifth row and alternating the hives, it is possible to secure very even distribution of the bees among the flowers. This plan requires that the bees be removed as soon as the blossoms have fallen to get them out of the way of machinery used in cultivation, spraying, etc., and to avoid having workmen stung when busy in the orchard.

Since honey production is a highly skilled specialty which is not likely to prove profitable except in the hands of one who is well informed concerning beekeeping practice, it is often cheaper and more satisfactory for the fruit grower to rent bees for the short

B.—Difference in the yield of cherries, with and without proper pollination. (Reprinted by courtesy of American Bee Journal)

period when the fruit trees bloom. By this plan the beekeeper takes all responsibility of moving the bees into the orchard, caring for them while there, and taking them out again when their services are no longer needed. In some orchard districts there are beekeepers who make a specialty of this kind of service. The money received for moving the bees to the orchard cuts down operating charges for the season, and adds substantially to the net profit for the year. The fruit grower is relieved of the necessity of investing in bees and equipment and hiring someone to care for them, or adding that work to an already crowded schedule.

Prices for this service vary greatly in different localities, but $5 per hive seems to be the prevailing price in localities where the service is rendered on a large scale. While the beekeepr profits somewhat from the nectar gathered by his bees, it is no more than they might gather in a suitable locality elsewhere. Moving costs are heavy and five dollars per hive is none too much where strong colonies of bees are furnished. Of course, the fruit grower should realize that it is not so much the number of hives which are present but the number of bees in each hive. One strong colony may render a greater service than two or three weak ones.



Colonies in mature orchards should be distributed at the rate of one colony to the acre, about 210 feet apart each way. Notice the second colony in the background in above picture. With trees planted 40 feet apart each way, locate a colony near every fifth tree in every fifth row.

(Reprinted by courtesy of American Bee Journal)

As to the number of bees necessary, it is impossible to make any rule to fit all cases. When the weather is fine at blooming time the bees are able to fly for the greater part of the day and thus can visit an immense number of blossoms. It is during the unfavorable seasons when there are only a few hours of sunshine that the bees render the greatest service. Then it is that a few extra hives placed close to the trees will pay big dividends. The Michigan cherry grower who by help of the bees increased his crop by $7000.00, would hardly consider the cost of fifteen or twenty

extra colonies, even though the price was $5 each for the period of bloom. It is under just such unfavorable conditions when the weather is cold and cloudy, windy and wet and bees stay close to the hive, that the orchard with hives scattered throughout will yield much better than one with the bees all in one spot nearby. With the bees all in one apiary there is likely to be a crop of fruit near the bees and a gradual diminution as the distance increases until little fruit is set at the side farthest away.

In the favorable spring one colony of bees may be sufficient for from five to ten acres of trees. In the unfavorable season one hive may be hardly enough for one acre. The best insurance is to have plenty of bees for any kind of season and, in the long run, this policy will bring good returns on the money expended.

The fruit grower who is not able to rent bees from some capable beekeeper, or the one who has a sufficiently large orchard to justify a considerable investment will do well to adopt a system of management that requires a minimum of labor and care. The use of a large hive such as the Modified Dadant will greatly simplify his problem. At this point let me say that no beehive in common use is patented and the adoption of any particular equipment does not interfere with buying supplies from a favorite dealer.

VISITING ILLINOIS BEEKEEPERS*

(H. H. Root, Medina, Ohio)

A beekeepers' tour extending over several days usually succeeds according to the care with which the tour is planned and the promptness with which it is carried out. Staying too long in one place and then cutting out some part of the tour altogether to catch up results in confusion. The Illinois tour was carefully planned and the plan rigidly executed. It lasted from August 1 to August 4, and covered 550 miles in central Illinois. Part of the route was along the Sangamon River, the scene of so many of Abraham Lincoln's boyhood days, and all of it over highways which he constantly traveled—prairie country, beautiful, historical, and full of interest for every one. To Professor V. G. Milum should go much of the credit. He had an enormous police whistle, and also a habit of blowing this whistle right in the midst of heated arguments, discussions, or demonstrations; but we soon found that whenever his whistle blew we had to jump for our cars. By this rigid adherence to a pre-determined schedule, every part of every day was carried out practically on schedule time.

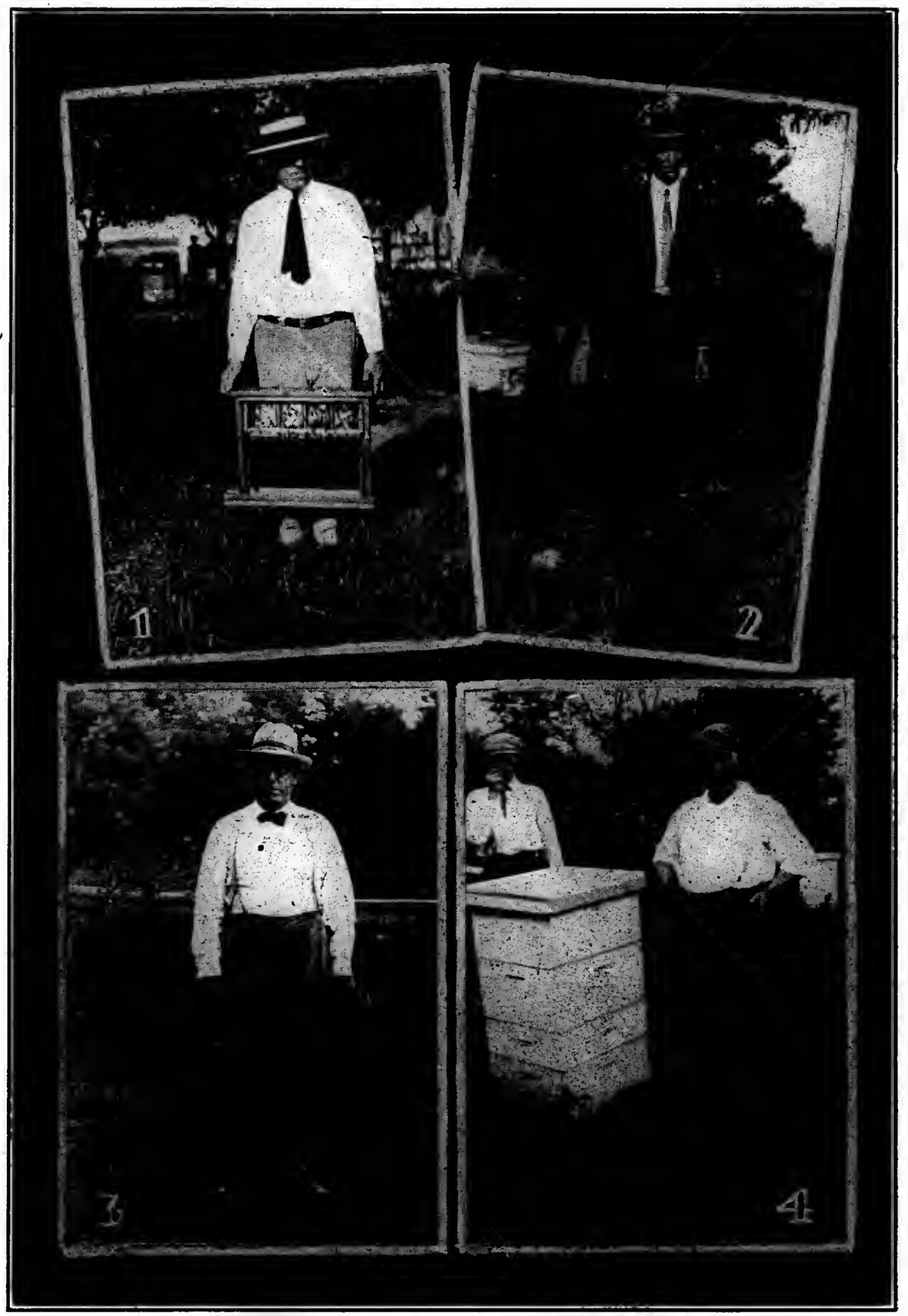
Professor Milum had had a number of large enamel-cloth signs painted in red, and these were tied over the spare tire of each car. This feature alone attracted a great deal of attention, as evidenced by the interest shown as the long string of automobiles passed through the cities, towns, and rural districts. A good many thousand people in central Illinois, by Saturday, August 4, knew for the first time that beekeeping has become a real business and that honey producers are enterprising and wide-awake enough to engage in a businesslike investigation of principles and methods as practiced by others.

In central Illinois the honey season was quite unfavorable this year, but in spite of this a total of 161 different beekeepers participated in the tour—the largest attendance recorded being at the apiary of Mr. Frank Zadel, Witt, Illinois, at noon of the third day. At the various meeting points where the discussions, speeches, and demonstrations were given local beekeepers were always in attendance, and frequently the local producers became enthused enough to go on to the next point, or to spend even an entire day traveling from one point to another. The number of automobiles participating was never less than a dozen, there were sometimes more than double that number in the "parade."

The tour started at Normal, Illinois, at the apiary of J. L. Wolcott. Mr. Wolcott has about thirty colonies in standard hives

* Reprinted from Gleanings in Bee Culture, November and December, 1928.

1. W. E. Crowe, Gibson City, with his two sons, M. E. Crowe and O. P. Crowe. 2. E. J. Steinberg, Sibley, with his two sons, E. A. and R. L. Steinberg. 3. J. T. Hendricks, Chatsworth. 4. John Diercouff, Ridgeville, in his comb-honey apiary. 5. H. L. Dunn, Onarga, in the midst of his 131 colony back-yard apiary. 6. J. N. Koritz, Buckley. 7. J. N. Koritz's apiary, Buckley. 8. Mrs. P. J. Vollmer, Macon, and her 80 colony apiary. (Reprinted by courtesy of Gleanings in Bee Culture)



SOME MORE OF ILLINOIS BEEKEEPERS

1. J. H. Bearden, Taylorville. 2. E. F. Berry, Taylorville. 3. J. F. Rissinger, Mason City. 4. Mr. Schoff, of Schoff Brothers, at Peoria.

(Reprinted by courtesy of Gleanings in Bee Culture)

and has had a fair crop this year. He had been having some loss of bees caused by entanglements on the bees' legs, due to pollen from milkweed. The writer did not join the tour until the next point visited, hence did not get a picture at this point.

The second stop was made at the home of W. E. Crow & Son at Gibson City. Mr. Crow has about 65 colonies. He is fortunate in having two sons, both interested in bees, one of them being his father's right-hand man. Mr. Crow produces both comb and extracted honey, and therefore uses shallow supers exclusively. His main source is sweet clover. In 1926 especially he had a great crop of Hubam clover that began blooming early in August. Mr. Crow has shipped comb as far away as Boston, Massachusetts.

Edward J. Steinberg, of Sibley, Illinois, is another beekeeper fortunate in having two sons who act as right-hand men. Mr. Steinberg has about 75 colonies. He requeens every two years —that is, renews half his queens every year, either in the spring or early in August. Most of his crop he markets in five and ten pound pails, shipped by parcel post at one dollar and one dollar eighty-five cents postpaid, respectively. For shipment in this way it is, of course, necessary, as Mr. Steinberg pointed out, to solder the lids in four places in order to conform to postal regulations. Mr. Steinberg advertises in various farm journals. Some years the larger part of his crop is shipped out by parcel post. Outside of the third zone he either puts the pails in a carton or sends the honey by express.

Edward Adams at Strawn, Illinois, believes in "hot" bees. If his bees get honey he does not care how cross they are. Mr. Adams' apiary is in a well-kept orchard, and the principal source of honey is sweet clover.

J. T. Henricks, at Chatsworth, Illinois, makes his own foundation and raises his own queens. He has 108 colonies in eight-frame hives, which he advocates for comb-honey production. Mr. Henricks had taken off some honey, but was not expecting much of a crop this year.

John Diercouff, at Ridgeville, also a florist and berry-grower, produces comb honey exclusively. At the time of the tour he was sure of a two-super average, and thought the crop might run to three supers per colony. As there is no alsike clover in this locality, the source of his honey is almost exclusively sweet clover. Earlier in the season there is a little white clover that helps out in brood-rearing. Mr. Diercouff winters outside on the summer stands in single-hive winter cases.

While not a scheduled stop, there was an extra half hour available late in the afternoon of the first day and we took advantage of this fact to call on Mr. H. L. Dunn, of Onarga, Illinois. Mr. Dunn has 131 colonies in his back yard, right in town, the largest number of colonies that I have ever seen in so small a space. Many of

Mr. Dunn's hives and supers are home-made, but he says he is changing to factory-made. He had a good crop this year, and he ships most of his honey, since he lives in a small town and others supply the local market. He produces both comb and extracted honey. Mr. Dunn's wife and daughter take care of any swarms that issue. Most of the hives are located on square conduit tiles for hive-stands.

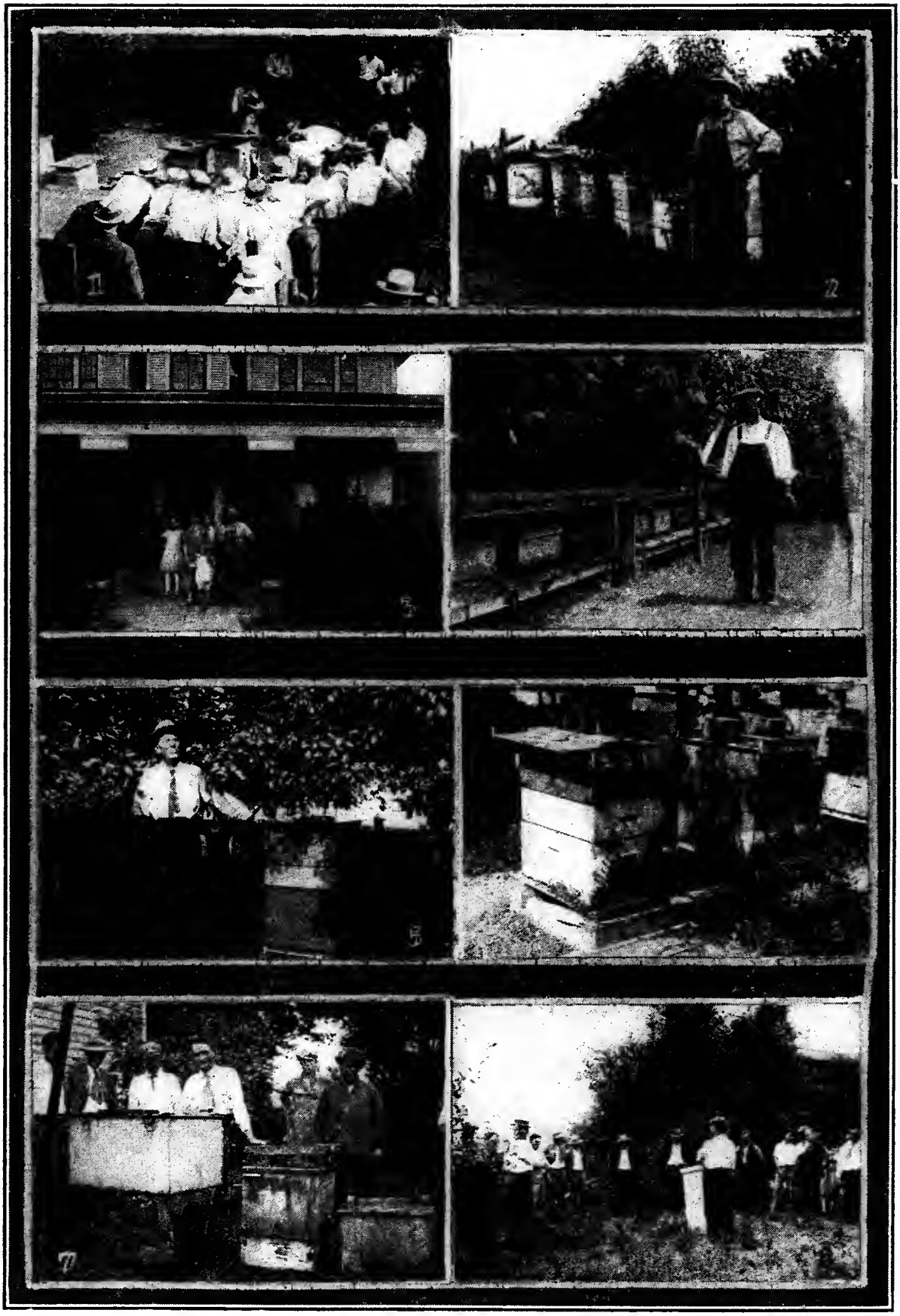
The last apiary visited the first day of the tour was that of J. N. Koritz, four miles north of Buckley. Notwithstanding that most of the sweet clover in this locality was winter-killed, we saw a large field close to the apiary, in full bloom and very fragrant. Mr. Koritz has about 75 colonies in this yard, and his apiary is beautifully kept, part of it being under a grapevine trellis. The grass was smoothly cut, everything being well kept and up to date.

The evening of the first day was spent at Buckley, and after supper a program of speaking was held in the open air. A great many of the townspeople came over to the park to witness the demonstrations of new uses of honey.

Second Day

A couple of hours were devoted to an inspection of the equipment at the University of Illinois at the Vivarium Building. Professor Milum, being right at home here, acted in the dual capacity of host and general manager of the tour. In the college apiary

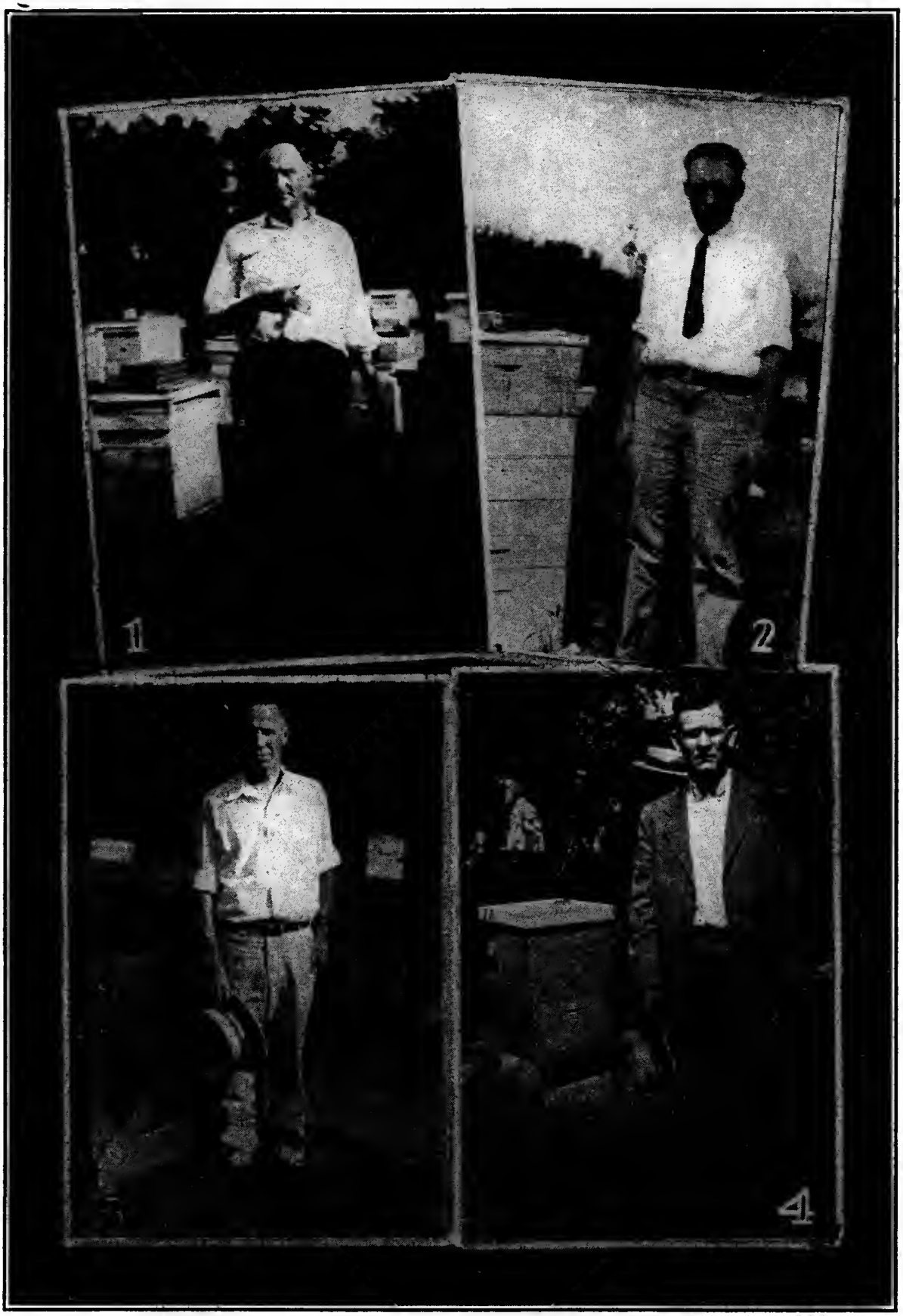
V. G. MILUM IN THE COLLEGE APIARY
University of Illinois, Champaign, Illinois
(Reprinted by courtesy of Gleanings in Bee Culture)



APIARIES VISITED ON THE ILLINOIS TOUR

1. Nobody hurt. Just an incident on the Illinois tour, in the apiary of John Haslan, Moweaqua.
2. Herbert Howell, Findlay. 3. Herbert Howell and his family on the steps of their home at Findlay. 4. Frank Zadel, in his apiary at Witt. 5. Frank Bishop, Taylorville. 6. Frank Bishop's apiary, Taylorville. 7. S. A. Tyler, San Jose, demonstrating his wax-rendering outfit. 8. Last meeting of the tour, at Schoff Brothers' orchard, at Peoria.

(Reprinted by courtesy of Gleanings in Bee Culture)



A FEW CLOSE-UPS OF ILLINOIS BEEKEEPERS

1. Edward Adams, Strawn. 2. George Rasmussen, Urbana. 3. John Haslan, Moweaqua. 4. O. W. Kennett, Ohlman.

(Reprinted by courtesy of Gleanings in Bee Culture)

right when the crowd was assembled, a swarm obligingly came out, to the huge delight of everyone.

At the sound of the familiar whistle, the tour was resumed on schedule time. The first stop was made at Bondville at a yard of Geo. Rasmussen's, who lives in Champaign. Mr. Rasmussen has at this yard about 30 colonies, and in his talk to the beekeepers he stressed the value of good queens. He has Italian bees only and manages to get along with practically no swarming. Mr. Rasmussen spends very little time with his bees—up to the time of the tour only about one hour per colony the whole season. He allows the bees plenty of room. He took 6000 pounds of extracted honey from 22 colonies in this location the year before. Mr. Rasmussen has two other yards. The main source of honey is sweet clover, although there are late flows of heartsease, giving two good sources of honey. He has been keeping bees for four years.

Apiary and honey-house of E. C. Brunner, Decatur.
(Reprinted by courtesy of Gleanings in Bee Culture)

Leaving the apiary of Mr. Rasmussen, a short stop was made at Emory Warner's apiary at Monticello, Illinois. Mr. Warner is an inspector, also secretary of the local association. While the yard in question that we visited has only about 40 colonies, he has other apiaries. He winters in two stories, without packing. He is now expecting to winter in one and one-half stories, as a full super is really too much. Mr. Warner produces extracted honey mostly, although he always likes to have a little comb honey.

A stop not on the schedule was that at the apiary of E. C. Brunner, who is very pleasantly situated at a bend of a road just north of Decatur. He has a common alighting-board for whole rows of hives—a rather novel idea.

After a splendid lunch at a roadside stand just north of Decatur, we made a quick run through Decatur to the apiary of Mrs. P. J.

Vollmer, at Macon, Illinois. Mrs. Vollmer is a capable beekeeper and has 75 to 80 colonies in ten-frame hives. She produces extracted honey mainly, although comb honey some years. She winters without packing, with a shallow food-chamber on top of the brood-chamber when needed.

John Haslan, Jr., at Moweaqua, Illinois, is a back-yard beekeeper who also has two sources of honey—sweet clover and Spanish needles. Mr. Haslan winters in packing-cases. The writer furnished a little diversion here when a screen gave way, resulting in an awkward tumble when climbing down from the porch roof. No bones were broken—no harm was done.

The last visit on the afternoon of the second day was to the home of Herbert Howell, at Findlay, Illinois. Mr. Howell is a farmer and fruit-grower. He also keeps bees because he likes the honey and likes the bees. Last year he produced 3000 pounds of cut-comb honey and also section comb honey from fifteen colonies. To help prevent swarming, Mr. Howell provides an entrance in the back of each hive by removing the back cleat of the floor-board.

Third Day

A very short speaking program was held at the start of the third day of the tour at the home of P. W. Slater, at Pana, Illinois. Mr. Slater raises bees and puppies—an unusual combination, perhaps, but a happy one. Mr. Slater has had a fair crop of honey.

The second stop this day was at the home of O. W. Kennett, Ohlman, Illinois, president of the county association. Mr. Kennett winters his bees merely by putting corncobs over the tops of the brood frames and a sack of dry leaves over all, for absorbing moisture. In the spring, if any colonies are weak, he unites them by the newspaper plan. He produces extracted honey mostly, although a little cut-comb honey. The latter he describes as a sticky product, and he expects to discontinue it. Mr. Kennett wages constant warfare against drones and believes in preventing them from being brought into existence. Mr. Kennett has a very large "Honey-for-Sale" sign in his front dooryard, and in front of this sign, under the shade of the trees, a short speaking program was held.

The largest attendance at any one time was reached at the next point, at Witt, Illinois, when 66 beekeepers met at the apiary of Frank Zadel. Mr. Zadel has a beautiful place, his apiary being arranged under grape-arbors. Some of the speakers, including the writer, expressed a desire to remain right under that grape-arbor forever, especially after hospitable Mrs. Zadel passed honey cookies and honey lemonade. There have been some gross misrepresentations as to the amount of honey lemonade that I drank. One wild reporter put the amount down as fifteen glasses. Not so; only eight glasses. Mr. Zadel made his own hives. Practically all

of them are thirteen-frame. He uses square supers, somewhat shorter than the hive. He had a good crop this year.

After lunch, the first stop in the afternoon was at Taylorville at the home of Frank Bishop. Mr. Bishop is an experienced beekeeper of long standing. His home apiary is pleasantly situated in his orchard. One member of the tour (not the writer) was made

Meetings in Montgomery County during annual tour.

1. One of the numerous speaking programs, this one at the home of O. W. Kennett, Ohlman, Illinois.

2. The whole group of visitors in Frank Zadel's garden, Witt, Illinois. (Reprinted by courtesy of Gleanings in Bee Culture)

violently ill by eating too many of Mr. Bishop's harvest apples. At the program held in Mr. Bishop's front yard he mentioned that his honey sources include dandelion and fruit bloom, in addition to some white clover and an abundance of sweet clover. Mr. Bishop also pointed out the great difference that a few miles often makes

in the yield of honey, the heartsease crop especially being very spotted this year.

We made a short stop at the home of a queen-breeder, J. H. Bearden, a neighbor of Mr. Bishop's. Mr. Bearden protested to Professor Milum that he could not make a speech, but we all asked him questions enough so that in the end he found out he could make a speech—and a good one at that.

The last apiary stop for the day was made at the apiary of E. F. Berry, near Taylorville. Mr. Berry is President of the Christian County Association. At his apiary great interest was shown by all present in one or two colonies, the bees in which, on the front of the hives, were "washboarding," that is, standing still and moving their heads up and down and to and fro. The movement

2. Those who completed the entire 1928 Illinois tour: Front row, left to right—B. F. Bell, Kingston Mines; Mrs. B. F. Bell, Kingston Mines; Mrs. Geo. W. Lynn, Lockport; Geo. W. Lynn, Lockport; Geo. F. Harris, Canton; J. W. McKendrick, Silvis; Lawrence Peterson, Kewanee. Back row, left to right—V. G. Milum; L. C. Edwards, Chatsworth; M. G. Dadant, Hamilton; Everett Warren, Chicago; H. G. Frymier, Carbon Cliff; Edwin F. Peterson, Kewanee.

(Reprinted by courtesy of Gleanings in Bee Culture)

is slow and measured. Many guesses have been given as to the cause of this same behavior. Who knows the right answer? No one seems to know the solution of the mystery.

Last Day

After a short get-together stop at the State Experimental Apiary, just north of Springfield, the tour was once more resumed. At the apiary of J. F. Rissinger, at Mason City, a distressing situation was revealed. Through the purchase of some bees, Mr. Rissinger got a terrible dose of American foul brood. On account of the inspection funds having given out early in the spring, there has been very little inspection in Illinois this season. Mr. Rissinger

is a sign-painter by trade, without much time to give to his bees, and before he knew it he had practically one hundred per cent infection. He has not lost heart and is determined to clean up and start new. Here's wishing him the best of luck and freedom from such unpleasant experience in the future.

The last scheduled stop of the tour was at the extensive fruit orchards of Schoff Brothers, west of Peoria, Illinois, where a speaking program was held. Mr. Schoff explained that he keeps bees, not for the honey, but for pollinating his fruit trees. He has 126 acres of fruit, and at present forty colonies, although he expects to increase to one hundred, as he is convinced there should be at least one colony to the acre in a mature orchard, the bees being distributed around to more thoroughly pollinate the blossoms. Mr. Schoff pointed out that in extensive fruit growing it is impossible to avoid some spraying of blossoms, although this is never done when it can possibly be prevented.

There were fourteen who completed the entire tour. The average attendance at each stopping place was between 40 and 45. It was a strenuous tour, but well managed from start to finish. At no time did local beekeepers have to wait over a very few minutes for the dusty travelers to arrive. The interest and enthusiasm remained good throughout.

TEMPERATURE RELATIONS OF HONEYBEES IN WINTER

(V. G. Milum, Champaign, Illinois)

This article is presented as an attempt to review the literature upon the subject of the temperature maintained within the cluster of colonies of bees during the winter period. Many good articles upon the subject of wintering have not been mentioned since they contained no references to actual determinations of colony temperatures. Other articles, especially those published in foreign countries, may not have come to the attention of the writer, but these are, no doubt, few in number. On the other hand, comments upon the subject made by various writers will be included, although these persons have made no exact investigation or submitted any experimental evidence.

As the writer has recently reviewed the literature on the temperature of flight and the proper temperature of the cellar tor wintering of bees, no mention will be made of these phases of temperature relations. These subjects have been considered by the writer in the Reports of the State Apiarist of Iowa for the years 1927 and 1928, respectively. The temperature of individual bees and of the brood nest will be omitted in this discussion.

Probably the earliest recorded writings upon the honeybee that are now available are those of Aristotle who wrote previous to the year 322 B. C. Aristotle made no statements regarding temperature relations of bees, other than that bees die in the winter if insufficient stores are left or else they might leave the hive when the stores were consumed if the weather continued fine. Since Aristotle is supposed to have recorded all the known facts of his time, we may safely conclude that further temperature relations were not understood or observed, or else they were not brought to his attention. Pliny (77 A. D.) who copied much of the writings of Aristotle on the subject of bees and added theories of his own, many of which were false, apparently expressed no temperature relations of the honeybee. If we can credit the writings of Butler in "The Feminine Monarchie," published in 1623, we can probably safely assume that the later writers up to the time of Butler added little to the knowledge concerning the honeybee, for he says that Collumella, Varro, Palladius and others imitated the ancient where they thought best and often chose the worst when with the advantage of time they should have surpassed the earlier writers. Butler considered weather the worst enemy of the bees next to the bees themselves through robbing, with extremes of heat causing their death in summer, while in winter they are sometimes attract-

ed to fly out in too cold weather when the sun is shining on bright frosty or snowy days. He suggested shutting the hives up "close" to protect the bees from eastern winds and great frosts. He noted that continuous cold caused many to become sick and die when they flew out unless the weather was pleasant, but he made no definite statements as to the temperatures within the hive.

In 1884, Clarke (Gl. 14:91-2) mentioned Reaumur who in 1744 reported a torpidity which he regarded as the normal condition of bees in winter. Reaumur said that colonies of bees may be observed in freezing weather by turning the hives bottom side up without putting the bees in motion, when they will be found crowded and pressed closely together in a small space, yet Huber reported Reaumur as finding brood of all ages in a hive in January at a temperature of 93° F. in the brood nest.

Swammerdam, in 1758, wrote "that there is such a wonderful heat in the hives, even in the midst of winter, that the honey does not concrete or lose its original fluid consistence. nor is it gathered into grains or crystals, unless in hives in which the bees happen to be fewer than usual. The bees, when they are fruitful, nourish, cherish, and warm their offspring in the midst of winter, and preserve a mutual heat amongst each other."1

Keys, in the first edition of his book published in 1780, apparently was not quite sure what happened in a cluster of bees in cold weather for he expressed different ideas. At one point in his writings he said that he believed there was a variable degree of cold in which bees could exist in a beneficial torpid state, without injuring them, in which conditions they would consume no stores. He realized that bees individually could not resist cold slightly milder than the freezing point of water. But at another point Keys said that bees could resist certain cold but creating heat by muscular activity, the amount of resistance depending upon numerous environmental conditions, the larger colonies being more able to withstand cold. He noted that four unprotected colonies died during a cold spell in January, 1776, at a temperature of "15 to 28 degrees" while strong colonies survived.

Francois Huber, the celebrated blind naturalist whose "New Observations upon Bees" was translated by Dadant in 1926, denied the torpid theory of other authors when he said that with the outside temperautre several degrees below zero, the thermometer in sufficient populous hives stood at 24 to 25° R. (86 to 88¼° F.), which he said suggested that the bees cluster together at low temperatures and move to preserve their heat. Huber referred to the writings of Swammerdam and Reaumur, the latter of whom he quoted as finding a temperature of 93° F. in a hive with brood in January which Huber also observed.

1. Swammerdam, J., 1758. The Book of Nature; or the History of Insects, p. 172. London.

Bevan in his first book published in 1827, gave considerable upon the temperature of colonies of bees, apparently reporting for the most part the observations of others. He said that a summer heat was maintained in the hive in winter and that a thermometer placed in one ranged as high as 74° F. at Christmas. The rest of his statements were in regard to the results previously found by Schirach, Hunter, Huber, and Inch, the latter of whom he said plunged a thermometer into a bee hive in winter and saw the mercury stand 27° higher than it did in the open air. In his 1838 edition, Bevan cited the observations of Newport to indicate that the high temperatures are probably due to disturbances at the time of reading.

The original writings of Hunter have not been consulted by the present reviewer, but Schafer (1898, Textbook of Physiology. 1:792-3) says that Hunter, in 1837 reported finding that the temperature at the top of a hive full of bees in July was 27.8° C. (82° F.), with the outside temperature at 12.2 C. (54° F.); while in December the hive temperature was 22.8° C. (73° F.) when that of the external air was only 1.7° C. (35° F.). Bevan, previously mentioned, also quoted the same observations of Hunter. Schafer, apparently quoting further from Hunter, said that individual bees have so little power of keeping themselves warm that they soon become numb and almost motionless when exposed to the moderate cold of a summer night, but that the aggregation of large numbers in a hive insures the production of enough heat to keep the bees active in winter, which production of heat requires a constant supply of food.

According to Schafer, Wells and Bevan, Newport writing in 1837 (Phil. Tran. London. 2:259-338) reported upon his numerous observations upon the temperature of bees. Newport found that when the insects were in a state of activity their temperature was above that of their surroundings; the larva and pupa had a lower temperature than the adult, but had less power of generating and maintaining this temperature. In winter, the temperature of a hive fell considerably when the bees were in a state of repose and varied slowly with that of the outside atmosphere, these periods of repose being a deep sleep, not torpidity, broken at intervals by periods of activity. Very low atmospheric temperature aroused the bees, and this prevented any great fall in the temperature of the hive. With an outside temperature of -7.5° C. (18.5° F.) at 7:15 A. M. January 2, 1836, Newport found that of the hive to be -1.1° C. (30° F.) and the bees were quiet, but after the bees were disturbed by tapping the hive, the temperature rose to 21.1° C. (70° F.) within fifteen minutes. At another time, Newport reported that with an external temperature of 1.4° C (34.5° F.), that of a hive full of active bees was 38.9° C. (92° F.)

Newport's original article is not available to the author at the present time, but it is evident from a study of the temperatures

given in the last paragraph as well as of a somewhat more detailed report of Newport's methods given by Wells, in the Report of the Commissioner of Patents, for the year 1860, that the bulb of the thermometer was not always in the center of the cluster for according to Wells it was only inserted about an inch within the free space of the hive. With this information, it is easy to account for the varying temperatures reported by Newport since high temperatures were only recorded apparently when the bees were disturbed or they were spread about in the hive at times for securing food.

An article by an unknown author, published in Volume VI of "The Naturalist's Library" in 1840, (Rep. Bee World, 1:108) discusses the reports of temperatures of winter clusters as found by previous authors, suggesting that weak colonies may not be able to keep up their temperatures in severe weather and may perish if the cold continues for a lengthened period. Further evidence to show the truth of this statement will be given later in this paper. The article also suggests that if the weather is mild, weak colonies may consume their stores, and then possibly perish from starvation in the spring.

Writing in 1844, Huish, the notorious critic of the justly famed Huber, quoted from Huber, Keys, and Duncan on the temperatures of the hives, criticizing them all, and ending with a false conclusion that bees remain in a torpid state during the winter in northern climates, thus consuming less stores, resulting in fewer deaths from famine.

Quinby, one of the early recognized authorities in American beekeeping, in his book published in 1864, gave a good account of winter conditions when he described the winter cluster as a sphere with the bees on the outside somewhat stiffened by cold a part of which lose their vitality as the cluster shrinks away from them with further drops in the temperature, while the inside of the cluster is brisk and lively as in summer. He also pointed out that when cold or severe weather prevails, some bees that are on the outside of the cluster are separated from the center of the cluster by the combs and cannot shrink with it, hence are found frozen to death. He did not believe that the reports from Russia of bees remaining torpid during the winter could be true if they were the same kind of bees. He pointed out that bees may not be able to conserve their warmth and thus are liable to freeze if the combs were filled with honey with no empty cells for clustering space. A small colony even with clustering space, he says, may be found frozen or even starving. In cold hives, Quinby pointed out that continued cold may cause the formation of more and more frost and ice until the bottom board is covered and the bees smother as a result, or the bees may starve because they cannot move to stores which are covered

with frost, or that it may be the cause of dysentery because of a large amount of the water having to be retained in the excrement because of lack of transpiration at cold temperatures. Quinby suggested keeping bees warm and comfortable as a means of saving stores.

Wagner (ABJ. 2:76) in 1866 in a general discussion of the wintering of bees expressed the idea that bees are often found dead in the hives with plenty of stores remaining, because after having eaten their supplies above in the combs they are then unable to move sidewise to the lateral combs because of lack of passageways, which loss he suggested might be eliminated by making an inch hole through the combs with an auger. He further suggested that bees might be protected from driving winds and extreme cold, with the surrounding temperature being kept moderate and equable, yet low enough to retard the commencement of brood-rearing until the close of March. In a later article (ABJ. 2:159) published in 1867, Wagner reported that a temperature of 23° F. showed on the bulb of a thermometer a little way in a hive when the outside temperature was at 7° F. He suggested that it would have risen as high as it does abroad during the warm days in summer, had the bulb been inserted where the bees were clustered.

In 1867, Kirby and Spence (ABJ. 2:191-2) after reviewing the writings of Reaumur, Bonnet, Swammerdam, Huber, and Hunter, concluded that the clustering of bees in winter is for the preservation against the benumbing effects of cold, that probably bees do not pass the winter in a state of torpidity in any climate, but that strong colonies in well insulated hives seem able to generate enough heat to counteract the ordinary temperatures to which they are exposed. These authors suggested that bees consume less food when exposed to the lowest temperatures that they can withstand than they do at higher temperatures, which fact they claim was recorded by Reaumur and corroborated by the almost universal opinion of writers upon bees, yet as further proof of their assertion they pointed to the observations of Hunter whom they said found that a hive grew lighter in a cold than in a warm week of winter. It is difficult to understand how the observations of Hunter can be thus construed to prove the point in question. The authors criticize Reaumur, than accept his conclusions, which happen to be partially in error. This article appears to be a good illustration of the many cases of misinterpretation of the observations upon bees by other investigators.

Langstroth (ABJ. 3:136) in a letter to the editor of The American Bee Journal in 1868 said that when bees contract their winter cluster with increasing cold the bees on the outer combs do not always strike the winter passage in the combs, whereupon they huddle together and perish. He suggested that practically empty

combs should be left in the center, into the empty cells of which the bees could crowd in forming their cluster.

Bickford (ABJ. 4:109-110) in 1868, suggested that bees must either be wintered in a repository where frost cannot enter or else in the sun without any outside covering on the hive where the sun can warm them up occasionally, almost daily, thus giving the bees an opportunity to bring fresh food supplies from the outer combs to the central part of the hive.

Gallup (ABJ. 5:33-4) reported that one winter a few years previous to 1869 the temperature was from 10 to 34° below zero for thirty-four days in succession in Wisconsin during which time every swarm of bees perished with abundance of stores in their hives, that were attempted to be wintered on their summer stands in shallow hives, Langstroth or box hives, but those in hives twelve to fourteen inches high wintered well on their summer stands. He suggested that bees could expand upward more easily than sidewise to gather in more honey to the clustering space. In another article appearing the same year. Gallup (ABJ. 4:152-3) claimed that during a previous winter in Canada when the temperature for 60 days in succession was not above 10° below zero and the mercury frozen eight days, all bees in hollow trees died except those with abundant ventilation at the top of the cavity or hollow, as did hive bees also unless they had upward ventilation.

Hunter, in his book published in 1875, gave nothing definite regarding the temperature of the honeybee, but said that bees can endure cold, but not damp, and that they needed ventilation during the winter to remove the excess moisture formed by the consumption of stores. In an editorial entitled "Our Own Apiary," Gleanings in Bee Culture (3:27) for 1875 gives the results of observations upon a cluster of bees saying that the bees on the outside of the cluster seemed perfectly comfortable, with no movement of wings or change of places, while as the temperature became colder quite a hum apparently came from the center of the cluster. Bees were observed to emerge from the cluster, fly off in the cold, fall down and die.

Berlepsch, in his book published in 1869, reported temperatures of 10 to 12° R. (54.5-59° F.) in the heart of a winter cluster, with the periphery near 8° R. (50° F.), while the sides and corners of the hive were covered with ice, at an outside temperature of -1 to -3° R. (29¾ to 25¼° F.)

Root (ABJ. 14:43) warned against beekeepers trying to winter on full combs of honey in the center of the clustering space since the bees must have empty cells for clustering or they will be frozen in cold weather.

Moore (ABJ. 15:496-7) in a paper read before the North American Beekeepers Society at Chicago in 1879 stated that the cluster of bees expands and contracts with rises and falls of the hive tem-

perature and where no protection of colonies is given, there is danger of bees perishing away from the cluster when a quick fall of temperature occurs.

In 1881 Dadant (ABJ. 17:242-3) wrote that the cluster gathers directly below the sealed honey, those at the top eat and feed those below, the mass moving upward as the immediate supply of honey is exhausted. Experiments show a temperature of 70° in the cluster, the bees remaining quiet and almost asleep at this temperature. A humming sound is due to bees fanning their wings to create heat which requires greater consumption of honey. Rising temperatures in the cluster may excite the queen to lay.

In 1881, Cook (ABJ. 17:258) in comparing honeybees with other insects, stated that "in a nearly uniform temperature of 3 to 8° C. (37.4-46.4° F.) the honeybees remain quiet, take little food and only move as the cold outside the cluster impels them to crowd toward the center, or in the absence of food in any part of the hive, to change the position of the cluster."[2] He said that heat is increased by action at colder temperatures, which requires greater consumption of stores, followed by excessive accumulation of feces which results in dysentery unless the bees have an opportunity for flight. For this reason he suggested wintering bees on clear honey or sugar syrup to eliminate the pollen, which is conducive to brood-rearing with its increased activities and probable disaster. Similar ideas were again expressed by Cook (Gl. 13:234-5) a few years later after Clarke had expressed his theory of hibernation in 1884, as given in the second paragraph following this. Cook then insisted that bees never hibernate, that they are always active, apparently wide awake, and that they must preserve their surrounding heat. He said that if the surrounding temperature remained very low or very high for long periods of time the bees become excited and consume stores, thus intimating that the bees could break their cluster in cold periods to move to new supplies of stores. In another article, Cook (Gl. 13:311) reported that he had found that the temperature of the cluster will always range from 20 to 30° F., above the outside cold in winter and in severe weather from 60 to 80° F. He asserted that bees take food, are constantly changing their positions and are easily aroused.

Dzierzon, in his book published in 1882, said that he did not think that the vitality of bees was ever lowered to the extent of rendering them insensible and totally torpid, as with many insects, yet is reduced to the lowest possible degree in late autumn and early winter, with perfect quiet and no humming especially at mild temperatures, there being no exertion to raise the temperature with the air immediately surrounding the cluster at about 8° R. (50° F.) at which bees are just able to move their limbs, and are momentarily unable to fly. He said that the temperature in the

2. Cook, A. J., 1881. Insect life during winter. A.B.J., 17:258.

cluster might be 12 to 15° R. (59 to 65¾° F.), at which brood would not thrive. At another point Dzierzon related that as cold increases the bees draw together into a dense cluster, where they pass the winter in a state similar to sleep. Farther on, he says that strong stocks do not suffer at a temperature of -10° R. (9½° F.) but if -18 or -20° R. (-8½° to -13° F.) is maintained for several days or weeks, the cold penetrates the thickest partitions and walls, the bees hum louder, and weak stocks suffer considerably. With severe and long continued frost, Dzierzon said that entire stocks "fall asleep forever" when their honey-stores above or in their nest are exhausted.

Clarke (ABJ. 20:758-761) propounded certain views on wintering at the Rochester National Convention in 1884, in which he laid down the old proposition that bees in cold climates instinctively sink into a condition of torpor or lethargy with the advent of cold weather and that when provided with proper shelter and sufficient food, they will infallibly winter well if they can "hibernate." He explained, however, that he meant hibernation to be a condition of perfect quietude. Clarke quoted various observations, many of which were in error, and failed to regard the writings that had hit upon the truth as good material for his discussion. These utterances of Clarke led to a long series of discussions of the true meaning of the word "hibernation," which when cleared up showed that Clarke really meant a condition of extreme quiescence in which bees remain quiet and consume very little stores.

In 1885, Southwick (ABJ. 21:85-86) asserted that bees do not hibernate, that if they were forced to do without food for 30 days they would probably die, and if they go into a state of "dormant vitality" produced by chilling, they will die if they remain long in it. He claimed that during cold weather the bees cluster on the combs as close together as possible, that the bees on the inside after taking a full meal of honey crowd outside, forcing other bees to the center of the cluster and continue doing so if they have honey in the cluster or right above it, and if they have a good comfortable hive and cold weather lasts, or if they cannot get to the honey they will starve.

Doolittle (ABJ. 21:181; Gl. 13:190-1; ABJ. 46:272-3) writing in 1885 and later gave the results of some observations which he made that year on the temperatures of clusters of bees. He used a self registering maximum and minimum spirit thermometer which he inserted between the combs which had been spread to three-fourths of an inch between combs. Doolittle kept the thermometer in one colony for a cold period of five days in which the outside temperature dropped to as low as 16° below zero. The coldest point reached in the cluster (presumably, the center) was 63° F. during this period. He found that the average temperature of the cluster of a good colony of bees was 64° F. when the outside tem-

perature was at zero outside the hive and that for every 15° change in the outside temperature, the change in the cluster is one degree. Thus: 16° below zero gave 63°; zero gave 64°; 15° above gave 65° and 28° above gave 66° F. in the cluster. Doolittle found that the temperature at points within half an inch of the top and of the sides of the cluster varied from 46° to 52°, according to the place and the coldness of the weather: one reaching 45°, that temperature, he says at which bees will barely fly in May. He suggested that these disturbances had caused diarrhea (dysentery) in some colonies, the lowest temperature in one being 75°. Doolittle thought that his experiments showed why bees used less honey in a cellar kept at not lower than 43°, when they only needed to raise the heat to 64° to 67° where those on the outside needed to raise it from 16° below to 63° F.

In answer to a query in the American Bee Journal, 1885 (ABJ. 21:234) "Do bees ever move from the outside to the inside of the cluster, and vice versa, to get food, after they have once clustered for winter," the following reports were given: Dadant and Son said that they did not move, but those near honey passed it to bees under them and so on; Demaree said that he had always had evidence of change of position but apparently bees passed honey to each other; Cook reported that they were constantly on the move; and Doolittle thought from his observations that there was no in and out movement.

Cheshire, in Volume II of Bees and Beekeeping published in 1886, said that the bees begin to crawl into the empty cells of the clustering space when the external temperature is about 45°, that they maintain a temperature within the cluster which though not constant is never allowed to drop below 65°. He suggested 40° as the most favorable for wintering since the bees exerted the least effort when the surrounding air was at that temperature. Cheshire further related the experiments of McLain, who is also later included in this review. Under optimum conditions Cheshire said that the bees maintain 65° by the slowest imperceptible breathing, while with colder temperature more rapid and intense breathing follows, followed by flapping of the wings if the cold continues, with greater consumption of honey and evolving of heat.

Dayton (ABJ. 22:230-1) in 1886 reported finding the temperature at different distances from the center of the winter cluster when the bees were not breeding, to vary from 52° to 72° when the temperature outside the hives was 43° F. He did not think this was the temperature of the body of the bees, because when bees are clustered in a high temperature the temperature at the center of the cluster is lower than it is when the bees are clustered in a lower temperature. He said that the difference in temperature is causd by a difference in compactness of their cluster. In colonies that had brood in early spring, he found a temperautre of 88° at

the center of the cluster and 71° at the sides of the cluster. The following year Dayton (ABJ. 23:183-4) reported that the temperature of the cluster averages about 70° (presumably the center), with 56° F. at the outside edge when the bees are quietly clustered. Again in 1892, Dayton (ABJ. 29:347-349) reported temperatures of 61 to 65° F. at the top of the cluster amongst the bees in some colonies, while in one suffering from dysentery the mercury stood at 80°.

Kanzler (ABJ. 22:309-310) reported in 1886 of inserting a bent thermometer into a hive to a depth of about five inches, which could be read during the winter without disturbing the bees other than that caused by carefully lifting the cover at the time of each reading. It is apparent from the temperature reported by Kanzler that his thermometer was not always in the center of the cluster. He found a temperature of 70° F. with an outside temperature of -22°; and 41° at another time of -5°. The highest and lowest inside temperatures observed each month were as follows: For October, 87° and 64° F. at 44° and 40° F. outside temperature respectively; November, 75° and 52° at 63° and 31° outside temperature; December, 56° and 46° at 39° and 21°; January, 81° and 50° at 5° and 48°; February, 60° and 32° at 45° and 7° and 16° F., outside temperature, respectively.

Tinker (ABJ. 22:808-9) in 1886 asserted that bees exercise when they are subjected to cold temperatures, but it is in the form of a forced respiration, gradually increasing in its rate until quite rapid, without any other movements being visible until they begin to move about. He was sure that bees went through periods of hibernation between feeding periods of two or three hours length, the former of which he thought probably never exceeded ten or twelve days at a time. He claimed that the bees on the outside of the cluster become benumbed or torpid, did not take food and that there was no interchange of bees from the outside to inside of the cluster except when the bees warm up to feed. He was unable to observe any passing of food from one bee to another, especially those on the outside of the cluster.

Young (Gl. 14:301-2) partially defended Doolittle's assertion on the temperature of the winter cluster and criticised the theories of Clarke and Root, but his own experiments were not sufficient to be conclusive. Following the article by Young in the same issue of Gleanings in Bee Culture for April 15, 1886, Cross (Gl. 14:302-3) gave the results of his experiments upon the same subject. He thought that the temperatures observed by Doolittle (Gl. 13:190-1) were probably too low, possibly because the bulb of the thermometer may not have always been in the center of the cluster. At the beginning of his experiments he was almost convinced of the hibernation theory because of finding temperatures of 39 to 66° F. from February 10 to February 11, supposedly in

the center of the cluster, but careful examination showed that the bees had moved so as to leave the bulb two inches outside the cluster. From February 18 to 28, temperatures of 64 to 80° F. were obtained with the thermometer remaining nearer the center of the cluster, while the outside temperature ranged from 14° to 53° F. at the time he took his readings at morning, noon, and evening. Cross concluded that the colder the weather gets, the more closely the bees crowd together, maintaining all the animal heat generated and hence a higher temperature. As the day advances, the day becoming lighter and warmer, the bees expand the cluster to make motion possible to secure another supply of food which they need almost daily, this conclusion being judged from the fact that the temperature of the cluster was highest in the morning, lowest at noon and intermediate in the evening.

Gilliland (ABJ. 23:249-250) in 1887 pointed to the roaring of bees as evidence that bees were active during the winter and exercised to keep up the temperature, for he found that the audible roaring increased in the colonies of his apiary as temperature decreased at least to 20° below zero, while with rising temperatures it decreased until it reached about 40°, when just a perceptible hum could be heard with the ear at the hive entrance. In replying to Gilliland, Demaree (ABJ. 23:297) claimed that with his bees when the temperature approached zero or went below no sound issued from the hives, if the bees were in good health. This debate was replied to by other beekeepers in succeeding issues of the American Bee Journal, apparently the majority supporting the contention of Gilliland, others that of Demaree. Evidently the condition of the bees and the ideas of what constituted roaring influenced the results reported.

McLain (ABJ. 23:405-6) reported the results of extensive experiments in 1886 at the direction of the United States Etomologist. McLain found that bees enter into a hibernating state at a range of temperature from 48 to 52° F. according to the humidity. Experimenting at temperatures of 0° F. to 65° F., he found the shape of the cluster most permanent at 41° F., the colonies presenting the same outline for days together when this degree was maintained uniformly. He found that the bees roused themselves to activity at intervals of about a week with contented humming for 3 or 4 hours, taking of food, and reformation of the cluster, after which the humming ceased, respiration became slow, followed by silence until a change of temperature or demands of hunger again aroused them. The more perfect the conditions, the longer were the periods of inactivity. McLain found 37° F. to be a dangerous point, the danger increasing as the temperature is lowered or the humidity increased. The amount of activity at 44° F. was only slightly greater than at 41° F., hence McLain recommended keeping the cellar at 44° F. because of less danger if variation occurred at this

point since harmful variations from 41° were harmful in the proportion of 1° below to 2° above, the former coming too near the danger point 37°. With damp repositories, a temperature higher in proportion was required.

McFadden (Gl. 15:343-4) in 1887 reported that bees could be wintered at James Bay in northern Canada on no stores (yet in the hives) by packing them on snow in a cave, with snow packed above them which was not allowed to melt. Doolittle (Gl. 15:565) in 1887 reported that out of five different experiments along the "McFadden line" to determine how long he could keep half a teacup full of bees alive after being chilled, four and a half days was the latest point that any could be brought to life again by warmth with moisture and three and three-fourths days by dry heat. All the bees used by Doolittle had empty stomachs. Ten years later, Doolittle (Gl. 25:848-9) asserted that individual bees or even small clusters of 50 to 100 bees when separated from the cluster, often freeze to death; the isolated individual always succumbing to the cold with a temperature below 40° F. unless it warmed up within 36 hours after it ceased to move. He did not think that colonies of bees in a normal condition ever froze to death, except after starvation from lack of stores inside the cluster in long cold periods.

Root (Gl. 17:59) in 1889, suggested that when low temperatures are of only transient duration bees seldom suffer, but where we have a continuous week of weather below zero, especially if accompanied by high winds then there is danger for the bees. Pouder (ABJ. 28:286) suggested in 1891 that entrance blocks be removed from hives to prevent accumulation of moisture and frost on the combs about the cluster, since there is a high temperature in the cluster and a low temperature outside the cluster. Under such conditions he said that bees may starve to death in the midst of plenty simply because they cannot move to the side-combs which are thus cold and frosty.

Abbott (ABJ. 34:787-9) in 1894, claimed that bees do not freeze in winter, but starve because of lack of food in the right place. He suggested that food should be above the bees and recommended sugar candy as the source of supply. He claimed that there is an interchange of the bees on the outside of the cluster with those in the center of the cluster during cold weather. He said that on warm days bees moved their cluster to a new point or else carried stores into the clustering space. The following year Doolittle (Gl. 23:180) wrote that he was unable to observe any changing place of bees from the outside of the cluster to the inside, his observations having been made on clusters hanging below the frames. He thought that bees must pass honey from one to another.

Albrect (ABJ. 37:795) about 1897, claimed that bees in the cluster were constantly changing from the outside to the center of the cluster, 50° F. being the minimum temperature for the outer

bees, unless the temperature sunk below this point from lack of food or disease when death ensued through freezing. The greater the cold, the greater the consumption of stores to keep up the heat of the periphery of outer bees, which may result in brood-rearing, which Albrect said, required a temperature of 86 to 95°.

Miller (Gl. 26:254-5) reviewed the literature on the temperature of bees, apparently including Albrecht's observation, and then concluded that since the temperature of individual bees varied from 81.5 to 95° F., the bees attempted to keep the temperature of the outer edge of the cluster from falling below 50 to 53° F. Further conclusions apparently those of Albrecht were given.

The American Bee Journal for February 15, 1900, gives a table of temperatures of the cluster from the Beekeeper's Review, by Howe who reported the observation of McLallen of Cornell University. This table represents reading on two cellar wintered colonies and five colonies wintered oustide, from January 24 to April 10. At average outside temperatures of 19° to 48° F., the average temperatures of each of the colonies (presumably the highest temperatures recorded) ranged from 71° to 83° F., 64° to 77°F. 63° to 86° F., 73° to 80° F., and 71° to 84° F., respectively, with a temperature of 41° to 64° F., on outdoor hives but not in the cluster. At cellar temperatures ranging from 41° to 52° F., the average temperature of the cluster of the two colonies ranged from 65° to 75° F. and 54° to 62° F.

"An observer" (ABJ. 41:613-4) pointed out in 1901 that the larger the cluster the bees had in winter the greater their advantage in retention of heat since the radiating surface of the sphere decreases or increases on the square while the volume of the cluster increases with the cube. In like manner, he indicated that the larger cluster was proportionately in contact with a greater amount of honey. On this basis, he calculated that a single bee when incorporated in a 10-inch cluster must be afforded over sixty times more protection from cold that it would possess outside the cluster. Likewise this writer pointed out that where honey was stored above the cluster, especially in deep combs, the amount of honey within a given distance from the cluster was increased because of the deeper honey cells and reduced space between the combs, which also gave an advantage to the larger cluster of the proportionate greater surface in contact with the cluster. He concluded by saying that the size of the cluster and the depth of the combs are really the essentials of wintering and must increase with the degrees of latitude.

In 1906, Getaz (ABJ. 46:834-5) asserted that in winter the temperature of the outside of the cluster never falls below 68 or 70° F. He said that Dubost about 1800 observed that the center of the cluster often is warmer in cold weather than in warmer weather. The observations of Devauchelle published in Apiculture about

1900 were quoted, which described the winter cluster as being formed on empty cells with the bees loosely grouped between the combs except at the outside of the cluster where they form a compact covering.

Root (Gl. 38:35) in commenting upon the cold weather of January, 1910, suggested that if it continued there was danger to outdoor wintered bees in northern states even in double-walled hives. He said that the contracted cluster was able to withstand cold for a week to ten days or possibly longer during which period the bees take practically no food from the combs, using the honey within their honey-sacs or stomachs, and possibly some of the body tissues. He suggested that where the cold lasts longer than this period, clusters stiff with cold and immovable, may die. Where colonies are large, the cluster may not chill through, but the center of the cluster may move outward to get food while those on the outside appear to move inward, while within the cluster almost blood heat is maintained.

In 1911 Byer (Gl. 39:65-67) stated that he never found a colony dead with honey above the cluster, although he had seen dozens of cases where the bees had died during cold periods of weather with honey at the far ends of the combs. With only two or three inches of honey above the cluster, disastrous results are bound to occur during cold spells in spring or even in February because the bees will have consumed all their stores from above as it is consumed faster there than on the sides, and when a real cold snap comes the bees will contract the cluster away from the honey and then will starve. The observations of Byer recorded here were confirmed by Hand (Gl. 39:135-6) in the same year, basing his statements on observations on outdoor wintering in North-Central Iowa during spells of zero weather.

Miller (A. C.) (ABJ. 43:408-9) in 1903, gave 65° F. as the normal temperature of the winter cluster of bees. He pointed out that there was a constant circulation in the hive due to the warm air rising above the cluster, spreading out, and then sinking and passing out the entrance. In 1911, Miller (Gl. 39:664-5) said that the temperature within the hive and outside the cluster is within one or two degrees of the outdoor temperature, while that of the cluster is close to 70° F. In reply to this statement, Rexford (Gl. 39:729) reported that his tests with thermometers showed that in packed hives, the bees did warm the space inside the hive and away from the cluster. This apparently prompted Miller to make further observations for in 1912 he reported (Gl. 50:73-74) the results of measuring hive temperatures with long slender thermometers placed in clusters of bees, apparently in various types of hives but all with wide entrances. He found a temperature of 68 to 72° after the bees had quieted down, while the temperature outside the cluster was about the same as the temperature of the

open air, except just above the cluster where the temperature was just a few degrees below the center of the cluster. He said that the results are the same whether the hive has double walls with sawdust or chaff in between or whether they are only one-half inch thick. Distributing the thermometers caused a rise of 10 or 12 degrees in five to eight minutes, hence, he suggested, to avoid disturbing colonies of bees because of increased consumption of stores. Miller pointed out that in thin walled hives the temperature inside the hive but outside the cluster followed closely the temperature outside of the hive, while with the chaff hives, fluctuation was slower but eventually reaches the same level of cold to which the bees were exposed. With rising temperatures, the chaff hive, likewise, remain colder for a longer period. Miller said that the exact temperature changes occurring within the cluster after brood-rearing begins was not agreed upon by various investigators, some noting a regular rise and fall of about ten degrees each day, beginning about 10 A. M. and reaching a maximum about one hour later, remaining thus till about 1 P. M. and then falling to a minimum at 2 P. M., which was known as a feeding fluctuation. Others, he said, had observed a rise of only about 18° F. from the minimum of no brood to a steady temperature of about 88° F. in the presence of brood. He did not give the names of the observers whom he was quoting. Miller further pointed out that the chaff hives did give benefits to the colony in that it assisted in the maintenance of higher temperatures during brood-rearing when the cluster broke and spread out over the combs.

Holterman (Gl. 40:74-76), Byer (Gl. 40:76-78), and Root (Gl. 40:78), gave statements of conditions and results of reading of hive temperatures which seemed to prove that the results obtained by Miller regarding the low temperature inside the hive were not due to his large entrance (1x14 inches), the temperature inside the hive as recorded by the latter two writers being in general considerably higher than those recorded by Miller. Byer's readings showed an average of 35° F. difference between inside and outside; while Root's observations showed a difference of 28 to 38° F. higher inside of different double-walled hives at different distances from the cluster. Another set of readings gave 33° higher inside temperature to 1° lower than outside when there was a sudden rising of the outside tempertaure on a warm day. These observations serve as a good example of difference of opinion and results observed, which probably would not occur if all were observing the same set of colonies under the same set of conditions in the same locality.

Root (Gl. 40:125) reported movement of cluster from one part of the hive to the other during very severe protracted zero weather in 1912, suggesting that the bees probably increased their temperature to accomplish the shifting. On the other hand, he reported finding clusters completely dead, with all the immediate stores

eaten away but with plenty of stores in the hive. Root reported a varying temperature of 20 to 75° F. showing on one thermometer while the outside temperature was at zero and below, the temperature of 75° F. being noted when the bulb of the thermometer was in the center of the cluster and the outside temperature at 7° and 10° below morning and afternoon. He did not make clear as to whether the cluster was surrounding the thermometer bulb or not when the 20° F. was recorded.

Edgerton (Gl. 40:558-9) in 1912, called attention to the need of considering the "lag" of the inside temperature of the hive when heavily protected. His readings led him to the conclusion that about 45° is about the normal temperature in the upper part of the hive, if much warmer it is an indication that something is disturbing the bees, if much colder it is a sign that the cluster is too small for the frames they occupy or else they are not sufficiently protected from the wind. Edgerton reported a fairly strong colony that starved from being unable to reach stores.

Previous to the use of electrical thermometers or thermocouples by Phillips and Demuth (U. S. D. A. Farmers' Bul. 93), in 1912-1913, there is no knowledge of any previous investigator having made use of such apparatus for the study of colony temperatures. In contrast to the ordinary type of thermometer used by many previous investigators, these electrical thermometers can be read without disturbing the colonies, thus avoiding any abnormal reactions at the time of reading. Phillips and Demuth apparently used 19 electrical thermometers, 12 among the combs, 4 in the corners of the hives and 3 on the bottom board. They made the following statement as a result of their observations:

"When the cluster is above 69° F. it is less constant than when it is below this temperature, indicating that at temperatures above this point the bees move about to some extent, while between 57 and 69° F. they are quiet, unless flight is desirable owing to long confinement. When a colony is without brood, if the bees do not fly and are not disturbed and if the temperature does not go too high, the bees generate practically no heat until the coolest point among the bees reaches a temperature of about 57° F. At temperatures above 57° F. a compact cluster is not formed, but the bees are widely distributed over the combs. At the lower critical temperature, which is for the present stated as 57° F., the bees begin to form a compact cluster, and if the temperature of the air surrounding them continues to drop they begin to generate heat within the cluster, often reaching temperatures considerably higher than those at which they were formerly quiet and satisfied."[3]

Phillips and Demuth at the same time recorded temperatures of colonies fed on honeydew honey as against another colony pro-

3. Phillips, E. F. and G. S. Demuth, 1914. The Temperature of the Honeybee Cluster in Winter. U.S.D.A., Bul. 93, pp. 5-6.

vided with good stores. The colony with the honeydew honey gave temperature readings for the cluster varying from 71 to 91° F., at cellar temperatures ranging from 38 to 45° F., during a period from October 12 to November 25, the higher cluster temperature being reached on the latter date after which it dropped rapidly due to lack of bees. Another colony, as shown by a chart in Bulletin 93, page 8, maintained a temperature of the center of the cluster ranging from 64 to 71° F. during the same period, while after November 25, it showed a gradual increase of average temperature with occasional greater fluctuations, 89° F. being the highest point reached up to the end of the regular series of readings on March 6. They summed up the results as follows: "It therefore appears that the accumulation of feces acts as an irritant causing the bees to become more active and consequently to maintain a higher temperature, resulting in a reduction of the vitality of the bees. Poor food is evidently a more serious handicap than low temperatures. While the activity of the cluster is greater at some times than at others, there are not, as has been held, regular intervals of activity at which the colony rouses itself to take food."[4]

Phillips and Demuth also studied the formation of the cluster, finding that it consisted of "an outer shell of bees close together with their heads toward the center. The bees in the outer shell are quiet except for an occasional shifting of position. Inside this rather definite shell the bees between the combs are not so close together nor are they headed in any one way. Considerable movement, such as walking, moving the abdomen from side to side, and rapid fanning of the wings, takes place inside the sphere and when a bee becomes unusually active the adjoining bees move away, leaving an open space in which it can move freely. Two bees may often be seen tugging at each other. In addition to the bees between the combs, placed as above described, others are in the empty cells of the comb on which the cluster is always formed, always with their heads in. Evidently the bees in the shell, whether in the cells or between the combs, are less active than those in the interior of the cluster.

"The source of the heat of the cluster must, of course, be the oxidation of the food consumed by the bees. It is clear that heat for the warming of the cluster is produced by muscular activity. While, of course, some heat is doubtless liberated by other life processes, this is practically negligible when bees are quiet, as in Colony A when above 57° F. That higher temperatures may be produced, greatly increased muscular activity is required. For example, one bee was observed fanning vigorously for 7½ minutes. The rapidity of fanning of the wings varied, and toward the end

4. Phillips, E. F. and Demuth, G. S., 1914. The Temperature of the Honeybee Cluster in Winter. U.S.D.A. Bul. 93, pp. 12-13.

of the time it became so slow that the outline of the wings was distinguishable. Rapid respiration may play a more important part in heat production than at first appears. One bee was observed to breathe 21 times in 14 seconds and then cease the rapid respiration. On other occasions 50 or more bees would begin shaking their bodies from side to side. It is at least evident from the records obtained in this work that colonies of bees in winter, either in cellars or out of doors, should be disturbed as little as possible. This appears to apply especially to cold weather out of doors or in the cellar, especially after the colony has been confined for some time."[5]

In an article appearing in the Third Annual Report of the State Bee Inspector of Iowa for 1914, Phillips stated that the lowest temperature that he and Demuth had found in the winter cluster was 57° F. In giving some details of temperature studies previously mentioned, he said that the temperature of a particular colony cluster gradually dropped as the outer air cooled until the lowest one was 57° F. when the generation of heat began, with a maximum temperature of 89.4° F. noted the following day. Other information in this article is similar to that already cited, except under a discussion of humidity where a cluster temperature of 60° F. is assumed which the writer states could only occur when the external temperature is above 57° F. From our own observations, we are inclined to believe that under practically, if not all conditions with an outside temperature above 57° F., the highest temperature as well as the average temperature of the cluster will be considerably above 60° F.

In the Fourth Annual Report of the State Bee Inspector of Iowa for 1915, Phillips states that if the temperature immediately surrounding bees drops below 57° F., the cluster forms with the innermost portion rapidly acquiring a higher temperature, often as high as 90° F. in normal and higher in abnormal colonies. This statement is in direct opposition to various interpretations of recent years which would imply that the temperature of the winter cluster is 57° F. or that is the temperature which the bees try to maintain.

In the Report of the State Apiarist of Iowa for 1917, Demuth stated that a temperature of 57° F. and above is maintained within the cluster during the winter period and stressed the conservation of bee energy by protection from temperatures below 57° F.

In reviewing the work of Phillips and Demuth, Milner and Demuth (U.S.D.A. Bul. 988) state that "Temperatures as high as 30° to 35° C. (86-95° F.) are not uncommon, and indeed, were observed even when the air outside the cluster was as low as 0° C.

5. Phillips, E. F., and Demuth, G. S., 1914. The Temperature of the Honeybee Cluster in Winter. U.S.D.A. Bul. 93, pp. 14-16.

(32° F.)."[6] The writer of this paper is able to find only one reference in the article by Phillips and Demuth to a temperature of 95° F. which according to the authors was recorded soon after flight. In such a case the temperature of the hive is naturally increased because of the excessive activity of the bees.

Root (Gl. 52:879-881) in 1914 in commenting upon the results reported by Phillips and Demuth expressed the idea that when the inside temperature of the cluster goes as low as 57° F., the bees raise the temperature of the cluster even though the outside temperature is becoming colder and colder. This statement would indicate that 57° F. is also the highest point among the bees when they start to form a compact cluster, whereas Phillips and Demuth said that when the coolest point among the bees reaches 57° the bees form a compact cluster.

Gates (U.S.D.A. Bul. 96) reported in 1914 the results of his investigations in 1907 and 1908 upon the temperature of one bee colony in which he inserted six long stem mercury thermometers. Four of these thermometers were between the central frames and extended seven inches below the cover, spaced from front to rear, while the fifth was between frames three and four at the rear. The sixth was inserted from the side beneath the frames. Gates found that the rate of consumption of stores exhibited a relatively constant decrease from month to month, but he found it impossible to determine any relation or rythm in the consumption of stores to changes in temperature due to metabolism. He pointed out that during bad weather, the colony might actually gain in weight due to condensation of moisture, which would disappear during fair weather, giving a marked decrease in weight. The arrangement of the thermometers in the hive apparently left only one in the cluster that acted inversely to that of the other five in the cluster and the outside temperature, except that during the month of November when the bees were less definitely and constantly clustered, this central thermometer tended to follow the curve of the outside temperature. But from December to the beginning of egg laying, Gates found that the temperature of the center of the cluster reacted inversely to the outside changes in temperature while the other thermometers followed the course of the outside temperature. Some of these thermometers were on or in the edges of the cluster.

According to Gates, on warm days when the bees expand their cluster and move about the maximum cluster temperature increases to nearly as much as maximum summer temperautres, 91.76° F. (33.2° C.) being reported on a warm day in March. He said that the temperature of the cluster never fell below 62.6° F. (17° C.) and usually not below 68° F. (20° C.). The records show a gradual increase in the maximum temperature in the cluster as the winter

6. Milner, R. D., and Demuth, G. S., 1921. Heat Production of Honeybees in Winter. U.S.D.A. Bul. 988, p. 3.

progressed, but with the beginning of incubation the temperature of the center of the cluster rose to 93.2° F. to 95° F. (34-35° C.) and continued practically at that level. Gates found that the temperature below the cluster during the winter was practically the same as that of the outside air. He also found that the slightest disturbance of the cluster resulted in an almost immediate rise of the cluster temperature, appreciable throughout the cluster, which effects in some cases lasted four hours.

On a check colony in a glass observation hive, Gates observed that the cluster expanded and contracted with changes in outside temperature to warmer or colder, respectively, the expansion usually being downward toward the bottom of the frames and toward the entrance, usually not sidewise so as to cover more frames. He said that no matter how cold the day the bees were always active on the outside of the cluster, with a constant and gradual interchange of the bees on the outside of the cluster with those on the inside.

"So long as they are able to keep up their own body temperature they remain outside, but when chilled they pass into the interior. In cold weather the interchange may be expected to be greater."[7]

It is our contention that the author of the last statement probably erred when he assumed a greater interchange of bees in cold weather. This point will be explained in more detail at a later point in this discussion. Attention is called to the fact that Gates indicated that the coldest outside temperaure recorded during his studies was 14° F. (-10° C.) and that the only protracted cold period was from January 23 to February 1 when the outside air ranged about 32° F. (0° C.) These conditions were therefore considerably milder than the weather and temperature under which some of the later wintering experiments herewith reported were conducted. Gates heard an intermittent buzzing in his experimental colonies which was more noticeable on cold nights than on warm ones. He also mentioned a peculiar trembling of the bees.

In 1916, Brunnich (ABJ. 46:298-9) declared that when a colony of bees is dead from hunger, the bees are packed so closely together that any considerable free motion of the wings is excluded. With lack of food, heat production ceases, the cluster temperature sinks and the bees then become paralyzed and die. He admitted that during strong chills certain bees in the peripheric shell use their wings to create heat, but he thought that the greater part of the production of heat was purely chemical, except the small part played by the mechanical labor through the muscular work of respiration, circulation, and digestion. He suggested that during very cold weather the bees create sufficient heat in the center of

7. Gates, B. N., 1914. The Temperature of the Bee Colony, U.S.D.A. Bul. 96, p. 17.

the cluster to keep the bees in the periphery at 57 degrees, so that no bees will ever be chilled, with the conclusion that the cooler it is, the higher the temperature is in the center of the cluster.

Phillips, in his "Beekeeping" published in 1919, made the following statements to which the reader's attention is especially directed: "When the temperature is sufficiently high the bees generate no heat but, whenever the temperature of the air immediately surrounding the bees drops below 57° F. (the lowest temperature which normal bees ever experience in the hive), they form a definite cluster. As the outside temperature continues to fall, the cluster becomes more and more compact and the temperature of the inside of the cluster increases rapidly. Within certain limits, the temperature of the cluster increases as the outside temperature drops and, as the outer temperature again rises, heat generation is reduced or discontinued while the temperature of the cluster drifts to meet the rising outside temperature. The bees which form the shell constantly shift their positions and exchange places with bees from within. A bee from the center forces its way head first through the shell, then turns around and remains for a time on the outside layer. The shifting seems to be more rapid in cold weather than in mild."[8]

Phillips further suggested that the inability of the cluster to shift its position to new supplies of stores a few inches distant is often the cause of death of colonies by starvation in extreme cold weather. Similar statements are made in the 1928 edition of Beekeeping.

Demuth (Gl. 49:74) in an editorial in the February, 1921, issue of Gleanings in Bee Culture explained that the bees are more quiet in the early part of the winter, November and December, only generating heat sufficient to maintain a temperature of 57° F. in the outer margin of the cluster, while in later months there is more activity and more restlessness especially if the wintering stores are of poor quality, which results in the maintenance of higher temperatures within the cluster, causing a greater consumption of stores with the vitality of the bees being lost rapidly. Demuth gave a more complete discussion of these ideas in an article in the November, 1921, issue of Gleanings in Bee Culture.

Bullamore (Bee World. 3:129) reported a temperature of 85° F. as the temperature of a cluster of bees on December 12th, 1920, after a night when the temperature had fallen to 2° F., apparently an ordinary thermometer previously inserted or perhaps thrust into the cluster being used.

Milner and Demuth (U.S.D.A. Bul. 988) reported in 1921 on an experiment:

"To obtain information regarding the actual amount of work done by a colony of bees while in the winter cluster, a small colony

8. Phillips, E. F., 1919. Beekeeping. pp. 90-91.

on four combs having natural honey stores was placed in the chamber of a small respiration calorimeter and their carbondioxide production and oxygen consumption were measured for 10 days, while the temperature of the air surrounding the bees was kept just low enough so that the bees at all times would remain clustered."[9]

The temperatures were recorded by means of 14 thermocouples, but as they say the temperature responses cannot be considered as entirely comparable to normal undisturbed colonies, since this colony was in a respiratory chamber of a busy laboratory. They found that "during the 12 days that the bees were in the respiration chamber the temperature of the center of the cluster gradually rose from an average of 16° C. (60.8° F.) on December 13 to an average of 30° C. (86° F.) on the 22nd, though the air outside the hive kept in the range of temperature of 6° to 9° C. (42.8° F. to 48.2° F.). Since it has been shown that disturbances of any sort cause a rise in cluster temperature, it is not entirely clear to which disturbance the rise of this colony should be attributed."[10] The authors summarize as follows: "In the colony of bees under observation in the respiration chamber the expenditure of energy was reduced to the lowest limit by the maintenance of favorable temperature and by the avoidance of all disturbing factors, so far as possible. Under these circumstances, rarely found in the apiary, the energy produced by the bees, as measured by the carbon-dioxide and water produced and the oxygen consumed, was greater, according to body weight, than that produced by a man when working at hard manual labor, when we take into consideration the fact that the work was done by only a relatively few of the bees in the cluster. Even assuming that the work of the period was equally divided among the bees, their energy output per unit of body weight is higher than that of the average laborer. When we take into consideration the fact that usually the bees do not have such favorable conditions in winter as these bees had, it is clear that the energy output is enormous in the average apiary."[11]

From studies made of the insulating value of double-walled beehives, Phillips in 1922, concluded that "the loss of heat is most rapid through the bottom of all the insulated hives tested, and the insulation of top and sides is never used to its full capacity as so much of the heat escapes below."[12] Phillips also asserted that leaving the front of the hive unpacked also reduces any effect of further insulation that may be applied. Adding some bottom insulation to the commercial double-walled hives then on the market was recommended as a means of remedying their defects and making them more efficient.

9. Milner, R. D., and Gates, G. S., 1921. Heat Production of Honeybees in Winter. U.S.D.A. Bul. 988, p. 4.
10. Ibid, pp. 5-6.
11. Ibid, p. 14.
12. Phillips, E. F., 1922. The Insulating Value of Commercial Double-Walled Beehives. U.S.D.A., Cir. 222, p. 8.

Wilson, writing in 1922, says: "Temperature has a great deal to do with successful wintering of bees, but winter stores and the age of the bees are equally important. When the temperature goes as low as 50° F. on the outside of the hive, the temperature in the hive is about 60° F. and the bees are found moving around freely inside. With the temperature of 45° F. to 55° F. outside the hives the bees form a loose cluster. In this they remain more or less together but move about freely; and single bees may be seen moving about by themselves. The temperature at the edge of the cluster is about 58° F. to 60° F. Below 40° F. outside the hive, the cluster becomes more compact and rounded, provided the clustering space will permit. The upper edge of the cluster will be found just above the lower edge of the honey until the top bar is reached, then the cluster moves sidewise toward the rear of the hive unless the cluster was first formed at that point.

"If the temperature surrounding the cluster is not too low, the bees will shift the cluster according to the location of the stores. but it is not uncommon in the spring to find all the bees dead within the form of the cluster and plenty of stores only a few inches from the cluster. This is somewhat common during a severe winter in Wisconsin if bees are left out-of-doors and unpacked. Apparently the bees will not break the cluster when the temperature around them is below a certain point and thus starvation occurs. In such clusters the bees are found packed tightly together with a bee in each cell, head inward."[13]

A preliminary report in 1922 of studies made at the Minnesota Experiment Station by Chapman and France (Minn. Sta. Rpts. 1922, p. 69) stated that records kept indicate that the temperature of the cluster of bees does not vary either directly or indirectly with that of the surrounding air, other factors playing an important part. Their observations extended over three winters and as many as 145 thermocouples were used in a single hive. Correlations that were being worked out by statistical methods to determine the relation and importance of the various factors have not been published up to 1929 so far as the information of the writer of this paper extends.

Bartholomew (ABJ. 62:447-8) in 1922 reported that in the tropical area in the extreme southern portion of Florida, the temperature seldom falls below the critical temperature of 57° F. for the bees, usually not over one or two nights in a season, and then does not remain long enough at that temperature for the hive temperature to drop below 57° F., while in the sub-tropical regions there are only a few nights when the bees are forced to cluster. The writer pointed out that certain wintering problems as quality

13. Wilson, H. F., 1922. "Winter Care of Bees in Wisconsin." Wis. Agr. Expt. Sta. Bul. 338, 26 pp.

of stores and necessity for winter flights do not worry the beekeeper in Florida.

Brunnich (ABJ. 62:265) writing in 1922 said that in the center of the winter cluster of bees where the queen dwells the highest temperature is more than 85° F. while it diminishes toward the periphery so that the peripheral bees still have a temperature of 57° F. whether the outdoor temperature is 30° F. or -20° F. Brunnich stated that the temperature of the outer bees does not fall below 57° or else they would chill and die. He describes the production of warmth as of a chemical character brought about by the slow combustion of sugar in the bee's body, possibly in the glands of Malpighi, as opposed to the theory of production by circuitous tissues and uneconomical transformation of motion. Yet, he insisted that there is a constant current and motion, with the bees in the center of the cluster after having consumed their food moving to the exterior and the bees from the periphery moving into the center of the cluster to occupy the cells, continuing thus until the outside temperature rises sufficiently to allow the cluster to loosen and adjust itself to the changed conditions.

The observations of Gates and Phillips and Demuth are mentioned by Langstroth and Dadant in their 1923 edition. The clustering temperature of 57° F. is mentioned as also the increase of the temperature inside of the hive as the outside temperature decreases. They further state that in very cold weather the temperature of the cluster was raised to about 90°, apparently basing this statement upon the work of Phillips and Demuth. Further on Langstroth and Dadant say that with intense cold the bees keep up an incessant tremulous motion, creating heat by active exercise, those on the outside of the cluster upon becoming chilled, being replaced by others. Gates is quoted to corroborate this opinion, who as previously stated based his conclusions and assumptions on observations when the bees were not exposed to extremely cold temperatures immediately surrounding the cluster.

Root and Root, in the 1923 edition of A B C and X Y Z of Beekeeping, say that the temperature of the hive should be kept down to about 96° in summer; that during the winter the temperature of the cluster may vary from 32° to 97° F. according to conditions. They suggest that if a dairy thermometer is inserted into a cluster and examined a day or two later, if the cluster has not moved in the meantime, a temperature as low as 57° F. may be observed. Quoting from the work of Phillips and Demuth, these authors, 1923 Edition, indicate that when the temperature within the cluster drops to 57° F., the bees raise the temperature of the cluster even though the outside temperature continues to decrease. This idea is generally conveyed in the statements by Root and Root, but at one point they say that when the coolest point in the cluster reaches 57°, the bees begin to generate heat. Further on

Root and Root suggest that a prolonged cold spell lasting for weeks especially that down to zero may be disastrous because of the resulting dysentery. At another point, the statement is found that the temperature of the winter cluster should be about 57°, the point of least activity. Still further on, the authors say that when a thermometer placed on the bottom board inside the entrance shows a temperature of about 52° F., it may be surmised that the temperature of the cluster will be about 57° F., or the ideal according to their opinion. Similar statements are given in the latest 1929 edition of A B C and X Y Z of Beekeeping.

Armbruster, in 1922, first presented his "warmth theory" in the Archiv fur Bienenkunde, Volume 4, pages 268-270 and again in 1923 in The Bee World under the title, "The Heat Economy of Bees in Winter". His theory was based upon the observations of Lammert whose records were presented in detail by Armbruster in 1923, in Der Warmehaushalt im Bienenvolk. Armbruster concluded that when the individual surface bees of the cluster are cooled down to 13° C. (55.4° F.) they attempt to find a warmer spot by crawling into the interior of the cluster, where if it does not exist, more and more activity results, as other bees attempt to find an inner warmer place. This increased activity causes a sudden rise of the temperature up to 25° C. (77° F.), directly due to the increased oxidation from new supplies of food taken, respiration and muscular movements accomplished by the spreading of the cluster and the emptying of fresh cells of honey near the edge of the cluster. After this, according to Armbruster, the production of heat suddenly ceases, followed by a cooling of the cluster by convection and radiation, with the bees eventually being forced together by the cool air sucked in at the entrance of the hive, the cluster being formed in about three hours. The cluster prevents the rapid fall of the inner temperature, but it falls slowly during a period of about twenty-one hours until the critical 13° C. is again reached, in the meantime the surface bees constantly changing their position into the warmer interior. Armbruster, in the first two publications mentioned, cited one of four plates given by Milner and Demuth as a confirmation of his theory, which was the only one of the four that appears to even approximate the description given by Armbruster. In fact, the graphs of Lammert presented by Armbruster in Der Warmehaushalt im Bienenvolk do not all confirm the latter's theory for these particular sudden rises as described are not indicated during a continuous period of nine days of the twenty-nine days of temperature records presented in graphical form. It is furthermore apparent that Armbruster was writing under the impression that the bees in the outer shell or periphery of the cluster never attained a temperature lower that 13° C. (55.4° F.), probably misconstrued from the observations and conclusions of Phillips and Demuth.

Demuth (Gl. 51:116-7) in 1923, stated the temperature relations of a bee colony, by saying that the temperature in the margin of the cluster is about 57° F. If the outer corners of the hive are a few degrees lower, the temperatures of the inside of the cluster will be from

60 to 70° F., with the inner temperature gradually increasing as the outside temperature of the cluster drops, in order to keep the outer portion of the cluster from going below 57° F. In another article immediately following the last, Demuth said that when a colony is not well supplied with stores there is a danger of the cluster contracting away from contact with the stores during sudden cold spells and starving before the weather moderates enough for the bees to move their cluster or carry honey into the center of the cluster. In still another article in 1924 (Gl. 52:758-9) Demuth, in comparing large and small clusters for wintering stated that in small clusters there is relatively a larger proportion of active bees and the temperature averages higher than in the larger cluster. Likewise the amount of heat lost by radiation is proportionately larger in the smaller cluster. The result is that the bees are worn out earlier in the spring and generally the smaller cluster starts brood-rearing first.

Atkins and Hawkins, in How to Succeed with Bees, say that below 57° F. bees need protection, above that they fly. They conclude from the results of Phillips and Demuth that the ideal temperature for the wintering of bees would be just a degree or two below 57° F. to keep them clustered quietly with low consumption of stores. They suggest that the bees should be kept as nearly at this temperature as possible when the temperatures outside the hive are below 57° F. Further on they say that the necessity for packing is based entirely upon the necessity of allowing the bees to keep the temperature within the hive as near 57° as possible.

According to "The Press Mirror" in the Bee World for August, 1924, Himmer published the results of the measurement of winter temperatures in the hive by means of a self-registering thermo-electric thermometer. Himmer stated that the rapidity of the fall of outside temperature is the stimulus to heat production and not the attainment of a definite temperature (as Armbruster stated). In cold weather, the change of temperature inside the cluster is inverse to the changes of the outside temperature. At the lowest outside temperature recorded, -30° C. (-22° F.), a cluster temperature of 30° C. (86° F.) was recorded, and a temperature in the hive away from the cluster of -10° C. (14° F.). Sudden rises of temperature were noted at times but not at regular intervals, which did not conform with Armbruster's report here cited. The lower the outside temperature, the more sensitive were the bees to mechanical disturbances, and all disturbances, even slight caused a considerable deviation upward of the curve of the cluster temperature. The reviewer for the Bee World suggests that the results agree fairly with those of Phillips and Demuth.

Tinsley, writing in the Bee World, 1925, asserted that the winter cluster is formed when the temperature inside the hive falls below 55° F. Whether this is the result of his own experiment is not stated, but he states that temperatures inside of hives varied from the freezing point in unprotected hives to 55° in specially protected hives, the particular outside temperature not being given. Maintaining the outer temperature at 55 to 56° F. would mean a great saving of bee life as well as food.

He says that heat is generated by the rapid consumption of honey acted upon by oxygen, supplied by the breathing of the bees, most rapidly in the center of the cluster.

Brunnich (Erlanger Jahrbuch fur Bienenkunde. 3:154-160) in 1925, concluded from his experiments that his results did not confirm the hypothesis suggested by Armbruster, but indicated a somewhat even temperature in the cluster which never droppd below 28° C. (82.4° F.), but mostly ranged about 31 to 32° C. (87.8-89.6° F.). His records presented for one of several thermometers (No. 10) in the hive showed temperatures of 20.2 to 32.6° C. (68.4-90.7° F.) during a period of November 21 to 25 with outside temperatures ranging from -8.5° C. to 1.4° C. (16.7 to 34.5° F.). Judging from his conclusion, this thermometer apparently was not always the warmest one in the cluster. With outside temperatures of -4.3 to -0.2° C. (24.1 to 31.6° F.) from December 8-12, the No. 10 thermometer gave temperature of 28.5° C. to 32.5° C. (83.3-90.5° F.); while from January 14-17, with outside temperatures from -13° to 3° C. (8.6 to 37.4° F.), that of the No. 10 thermometer ranged from 32.8 to 33.6° C. (91.0-92.5° F.). No doubt, brood-rearing was in progress during the January period and possibly during the December readings.

Armbruster conducted further experiments in 1925 upon the temperature of two colonies placed in the bee cellar, the results of which he reported in The Deutsche Illustrierte Bienenzeitung for June, 1925. Flight weather had stimulated brood-rearing before the colonies were placed in the bee cellar where the temperature varied between 5.5° to 10° C. (41.9-50°F.). The temperatures were read by means of a Siemen's self-registering fever-thermometer which was usually in the center of the cluster but always covered by bees during the observations. The temperature records apparently failed to confirm the theories and data as previously presented by Armbruster and he himself said that "sudden rises in temperature, perhaps beyond 12°, as Lammert's average was, were not confirmed, but to be sure there was a very similar rise in temperature, when e. g. the hive was opened." Further on he admits, "The sudden rises in temperature observed by Lammert could also have occurred without disturbances, in case the domestic-affairs of the colony requires them."[14] This last statement seems to have been offered to support his original theory.

Park, in the Report of the State Apiarist of Iowa for 1925, in making certain deductions regarding cluster temperatures and winter protection assumes from the observation of Phillips and Demuth, that at 57° F. bees form a cluster and as the temperature of the outside air falls, the bees generate more and more heat maintaining a minimum cluster temperature *of 57 degrees*. He also assumes that any unnecessary heat production is excessive heat production. He states that 55 degrees atmospheric temperature should be ideal for the conservation of bee energy when there is no brood-rearing, which would give a temperature of 57° F. around the bees. With brood-rearing, occuring out of season,

14. Armbruster, L., 1925. Neue Versuche zum Warmehausehalt der Bienen im Winter. Deutsche Illustrierte Bienen-zeitung. 42:72-73.

Park, assumes the unnecessary expenditure of energy to the extent of the amount of heat necessary to raise the temperature of the brood-nest from 57 to 93° F. and maintaining it at that level. Using 57° and 93° F., respectively, as the temperatures maintained during absence and presence of brood in the colony, tables based on Iowa temperatures for 52 years are presented which indicate that bees must produce more heat in March, April and October than they need to produce from November to February inclusive, or during the normal broodless period. As stated these are based upon a cluster temperature of 57° F. whereas the temperature of the cluster may normally be as much as 30 degrees or more higher than 57° during the winter period as has been shown by many records without brood-rearing in the hives. If the higher temperatures of the cluster or even the average of the cluster instead of the minimum of 57° were used as a basis of calculations, the graphs of probable actual heat production would, no doubt, show a greater amount during the winter period instead of the spring period with its warmer outside temperatures.

According to Nolan, Hess in 1927 reported results of measuring temperatures by means of 28 thermocouples within the hive, using a potentiometer and also by a photographic apparatus which recorded the readings of an entire set of thermocouples for each hive in a period of 7 minutes. He advances the theory that bees take air into the cluster from the top and expel it through the bottom of the cluster. Hess believes that part of this air rises warming the air taken into the top of the cluster, while a part of this moisture laden air passes immediately through the entrance without condensing inside the hive.

In the Report of the State Apiarist of Iowa for 1927, Phillips states that the temperature of the cluster in winter varies from 57° to 93° F. The succeeding statement is not quite clear since it reads as follows: "This is the temperature range at the center of activity in the center of the cluster, and the parts of the cluster away from the region of greatest heat production may vary all the way between these two figures, while the bees at the outer edge of the cluster have a body temperature almost the same as that of the air immediately surrounding them, except that they never drop below 57° F. while normal."[15] Some question might be raised as to whether a bee is normal when it is numbed with cold on the outer shell of a cluster in an unprotected colony in a modern hive, or a colony with only nature's protection, when the thermometer is hovering around -15 to -20° F., or even in some cases at zero temperatures. The writer suspects when bees drop away from a cluster during one of these cold snaps, their temperature is far below 57° F., although the temperature of many points within the cluster will be several degrees above the same point.

In Research Bulletin 75 of the Wisconsin Agricultural Experiment Station, entitled "Winter Protection for the Honeybee Colony", Wilson and Milum give the results of an extended series of temprature studies of colonies of bees during the winter period at Madison, Wisconsin. The temperatures of five colonies of bees were observed by means of

15. Phillips, E. F., 1928. Report of the State Apiarist of Iowa for 1927, p. 45.

thermocouples or electrical thermometers, each hive being provided with 44 of the electrical theremometers. They were arranged at two levels in the hives, one at three and one-half inches from the tops of the frames and the other at six and one-half inches from the tops of the frames. From the front to the rear of the hive the thermocouples were arranged in rows three inches apart with the greatest concentration of thermometers at the center. Thus no two points were more than three inches apart and always several thermocouples were surrounded by the clustering bees. The construction and arrangement of the temperature determining apparatus is explained in detail in the bulletin as well as the methods of recording the data. Those interested in this phase of the work should consult the bulletin for more complete information.

The five colonies used in the experiment were provided with different types and amounts of protection. One colony was wintered in a standard ten-frame hive with a metal cover, without insulation, the entrance being reduced to a small size. Another colony was wintered in an ordinary commercial double-walled hive, without bottom packing, but with a six-inch packing tray above. The third colony was wintered in the bee cellar in a standard hive, with the full depth entrance. The fourth colony was wintered in a two-colony packing case which provided approximately six inches of packing on all sides, with twelve inches of planer shavings above. The fifth colony was placed in a single colony packing case which allowed 10½ inches of packing below and on the sides with 15½ inches of shavings above. All of the outdoor wintered colonies were located on the east side of a dwelling house within which was located the temperature reading apparatus in turn connected to the hives outside by the thermocouple leads running through rubber tubes. Thus all of the colonies were well protected from the cold winds from the west and northwest, while the colonies with less packing were protected somewhat from the north by the heavier insulated colonies.

Those who are interested in the complete results and the exact data presented by the Wisconsin Agricultural Experiment Station Research Bulletin 75 just mentioned should write for a copy of it. Several charts and tables are presented which cannot be covered adequately by this review. As the writer of this article was a co-author of the above bulletin, he submits herewith his conclusions on the subject of colony temperatures of the winter period based on a study of the literature on the subject as herewith reviewed as well as the experimental work covered by Bulletin 75. These conclusions, with slight changes in wording are a part of those presented by the writer in his thesis entitled "Some temperature relations of the honeybee colony" presented at the University of Wisconsin in partial fulfillment of the requirements for the Doctor of Philosophy Degree. As previously mentioned certain temperature relations have been omitted from this review because of having been presented elsewhere or are to be submitted in the future. Hence, this article does not cover the entire field of writings upon the temperature of the honeybee colony and its significance. However, with the exception of studies made of brood rearing temperatures and their

relation to development, all conclusions from the above thesis will be given, since they have not been previously published in full.

General Summary of Colony Temperature Relations

1. The writer has not made a special study of the temperature of individual honeybees, but after reading the literature one must conclude that the honeybee (Apis mellifica, L.) is essentially a cold-blooded animal when considered as an individual, since when it is not engaged in actual muscular activity, especially that of flight, its body temperature tends to follow that of the outside air. This has been shown by the experiments on the temperatures of individual bees by various authors, and by the fact that an individual bee upon coming to rest, after a flight at a temperature of 46° F., soon becomes chilled and numb. Exposure to chilling temperatures eventually causes the death of individual honeybees, at a variable length of time depending upon the degree of cold. At higher temperatures heat is produced in the bodies of the individual bees by the metabolism of carbohydrate foods, the rate depending upon the amount of body activity, manifested by flight, fanning of wings, shaking of the body, respiration, and other forms of muscular action.

2. While the temperature of 57° F. is accepted as the point at which a colony of bees forms a cluster when the coldest point among the bees reaches that temperature, it is not the temperature at which the periphery or outside shell of the cluster is maintained. On the other hand, the temperature among the bees of the outside of the cluster when tightly formed varies directly with the temperature to which the bees are exposed. With decreasingly low temperatures, the bees in the periphery of the cluster eventually become cold and stiff and then perish, as in the case of individual bees, if they remain in such a condition over too long a period. With such conditions existing in the outer shell of the cluster, it is impossible for the bees of the interior of the cluster and those of the shell to exchange places. While there is some interchange of bees exposed to higher temperatures, no normal bees can be expected to emerge from the warm interior of the cluster to take a place among the chilled bees on the edge of the cluster.

3. With the formation of the cluster the bees tend to contract the cluster at colder temperatures, within certain limitations. Since the bees are separated into bands by the midwalls of the combs, further contraction is limited after the cluster has once formed, to movements lengthwise and vertically of the combs, since the individual bees cannot and will not leave the cluster to pass around, over, or beneath the combs. At the colder temperatures, many bees are left stranded on the ends of combs because they cannot contract along the surface of the combs toward the center of that comb after they are once chilled. (This is essentially the idea expressed by Quinby in 1864, yet disregarded by most modern writers and lecturers on wintering of bees).

4. In general the temperatures within the center of the cluster, after it is once formed, exhibit an inverse relation to that of the outside

temperature; i. e. with a rise in the outside temperature, the temperatures of the interior of the cluster decrease, and vice versa. However, there are limitations upon this reaction, due to certain conditions. With outdoor wintered colonies, when flight weather of 46° F. or higher prevails or is approaching, the bees are usually aroused to the possibilities of flight at an outside temperature slightly below the flight temperature, which causes the temperature of the cluster to increase with an increase in the outside temperature. With cellar wintered colonies temperatures above about 50° F. seem to have the same stimulus. Unnatural disturbances of any kind, whatsoever, will cause a similar response in the temperatures of the cluster.

5. The inverse relation of cluster temperatures to changes in the outside temperature does not always exist with outdoor wintered colonies with little or no protection when the outside temperature drops to points below 0° F. or is maintained for long periods at temperatures near 0° F. At such temperatures, the bees appear at times to be unable to raise or even maintain the cluster temperature, due to lack of stores within the cluster and their inability to break the cluster and move to a supply of honey, under which circumstances many poorly protected colonies eventually will perish if the cold temperatures are long continued.

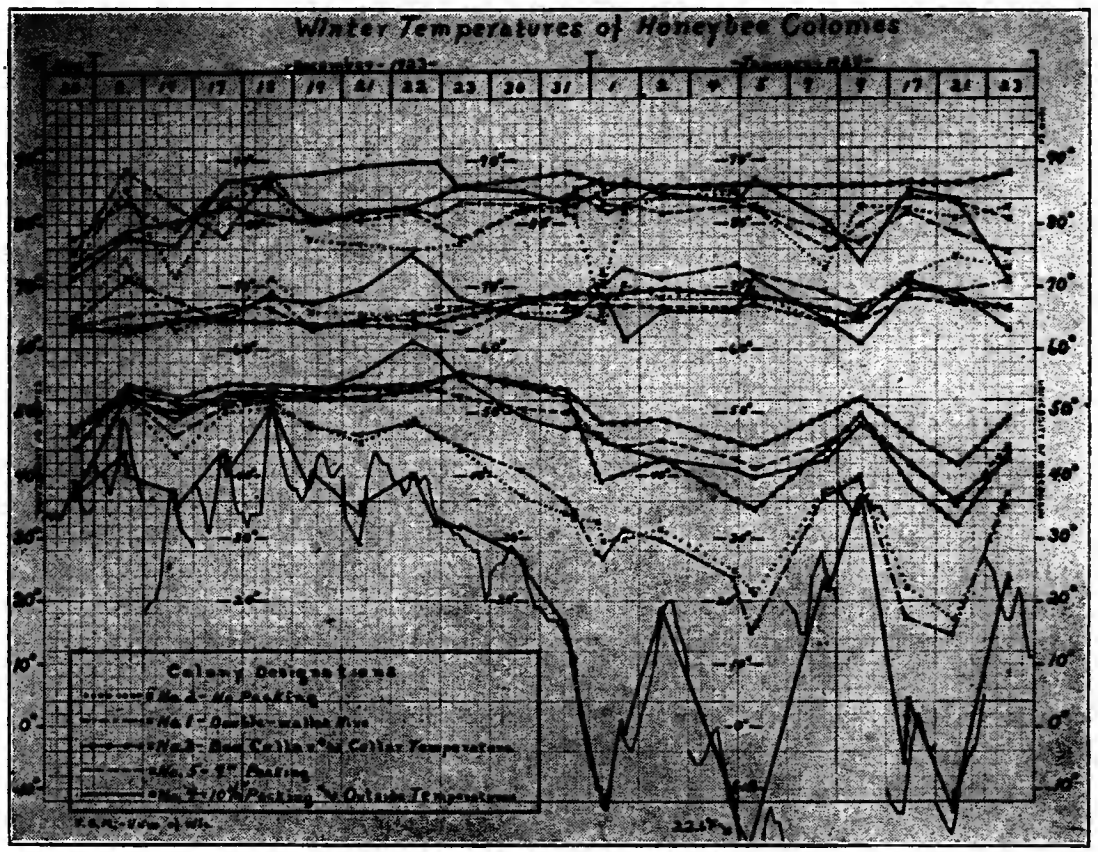
6. If at any time during the winter period, the reactions of the inner temperatures of the cluster do not follow the inverse relation to the changes of the outside temperature, then any succeeding readings of cluster temperatures cannot be expected to show the inverse reaction until a normal condition is again reached within the cluster.

7. Low temperatures are probably never the direct cause of temperatures of 93° F. being reached and maintained in the cluster during the prevalence of the low temperature. However continued low temperatures with intervening warm spells without opportunity for flight may eventually cause the colony to become excited and increase its temperature to a point favorable for brood-rearing if the bees become loaded with feces, especially if wintered on poor stores, provided the colony did not starve and then freeze to death during one of the extremely cold periods.

8. If a temperature of 56° F. is used as an arbitrary division point to determine points within a cluster that cannot be viewed directly by the investigator, then different colonies will show approximately the same average temperature in the cluster and the same high individual temperature when the temperature reactions within the cluster are showing the inverse reactions, allowing for the retarding effect of heavier insulation in the case of colonies with considerable protection. In the Wisconsin experiments of Wilson and Milum, the averages of those cluster temperatures above 56° F. when brood-rearing was not in progress, generally varied between 62°and 70° F. with the majority between 64° and 68° F., but slowly increasing with the progress of winter, probably due to the gradual increase of feces, which might have eventually stimulated brood-rearing, even if no flight had not been obtained. The highest temperature of the clusters studied tended to increase as

winter progressed, but it was more variable than that of the average of the cluster. While 62.9° F. was the lowest maximum temperature of the cluster ever recorded in any of the experimental records of the three winters of 1921-1924, generally a range of 76° to 86° F. included the highest temperatures of all the colonies under normal conditions when brood-rearing was not in progress.

9. Colonies provided with six and one-half to ten inches of packing are as well protected as those in a bee cellar with a temperature of 45° F., although the outdoor wintered colonies will use more stores and



Colony temperatures as reported in Wisconsin Experiment Station Research Bulletin No. 75.
Upper group of lines—Highest temperature of clusters of five colonies.
Group starting at 62° to 66° F.—Average of all points in clusters above 56° F.
Group starting at 44° to 47° F.—Average of all points below 56° F.
Lower discontinuous and continuous solid lines—Outside temperatures recorded at weather bureau and at point of experiment, respectively.

lose more bees in spite of earlier brood-rearing. Colonies with no packing and in double-walled hives are apparently about equally protected from outside cold during the winter as long as they have the same sized entrance, since the temperatures around the clusters are about equal. Such colonies can pass a cold winter if extremely cold periods are not of too long a duration, but they must suffer from being exposed to about equally cold temperatures (see chart of hive temperatures) with a consequent loss of the vitality of the bees. These conditions suggest that colonies in climates where temperatures drop below zero, should be provided with sufficient protection from the cold temperatures and suffi-

cient stores of good quality properly located above the clustering space which should not be much larger than what is necessary to accomodate the cluster when it is tightly compacted at the beginning of winter.

10. Regardless of the opinions expressed by many writers since the discovery of 57° F. as the temperature at which bees form a cluster that temperatures near this point are suitable for successful wintering, the long used 45° F. is still best for all practical purposes. Using the rule that bees winter best when they are most quiet is a good practice, but 45° F. will secure good results under practically all conditions, although the proper temperature will vary somewhat with the conditions of the cellar. Among these conditions are the humidity of the cellar, the amount of ventilation, the quality of the winter stores, the size and strength of the colonies, the number of colonies, the type of hive, the size of the entrance, and the time of the winter period.

11. When bees are in need of flight, such is apparently safe at a temperature of 46° F. in the shade, if there is no wind and the sun is shining. Flights in the earlier part of the winter do not stimulate the colony to brood-rearing, yet after a period of quiescene flights in late February, March and April usually stimulate colonies to begin brood-rearing regardless of whether pollen is carried in by the bees or not. However, brood-rearing may not be continuous from then on through the spring period, but is dependent upon the supply of pollen and honey in the hive and the ability of the bees to take further flights to gather supplies of nectar, pollen and water which are essential.

12. Temperatures up to 91° to 92° F. are apparently necessary to stimulate the beginning of brood-rearing but maintenance of such a temperature is not necessary for a continuation of brood-rearing. Temperatures as low as 76.3° F. were found in the brood nests with apparently no other ill effect than that of retarded development. Temperatures of 85° F. in parts of the brood nest are not uncommon during the spring period, although after brood-rearing is once well established in the late spring and summer, the brood area generally ranges from 90 to 95° F. A temperature of 98.2° F. was the highest ever recorded in a colony by the author. Temperatures above about 95° F. tend to cause the bees to hang outside the hive with loafing which eventually results in swarming.

ANNUAL SHORT COURSE FOR BEEKEEPERS

University of Illinois, Urbana-Champaign

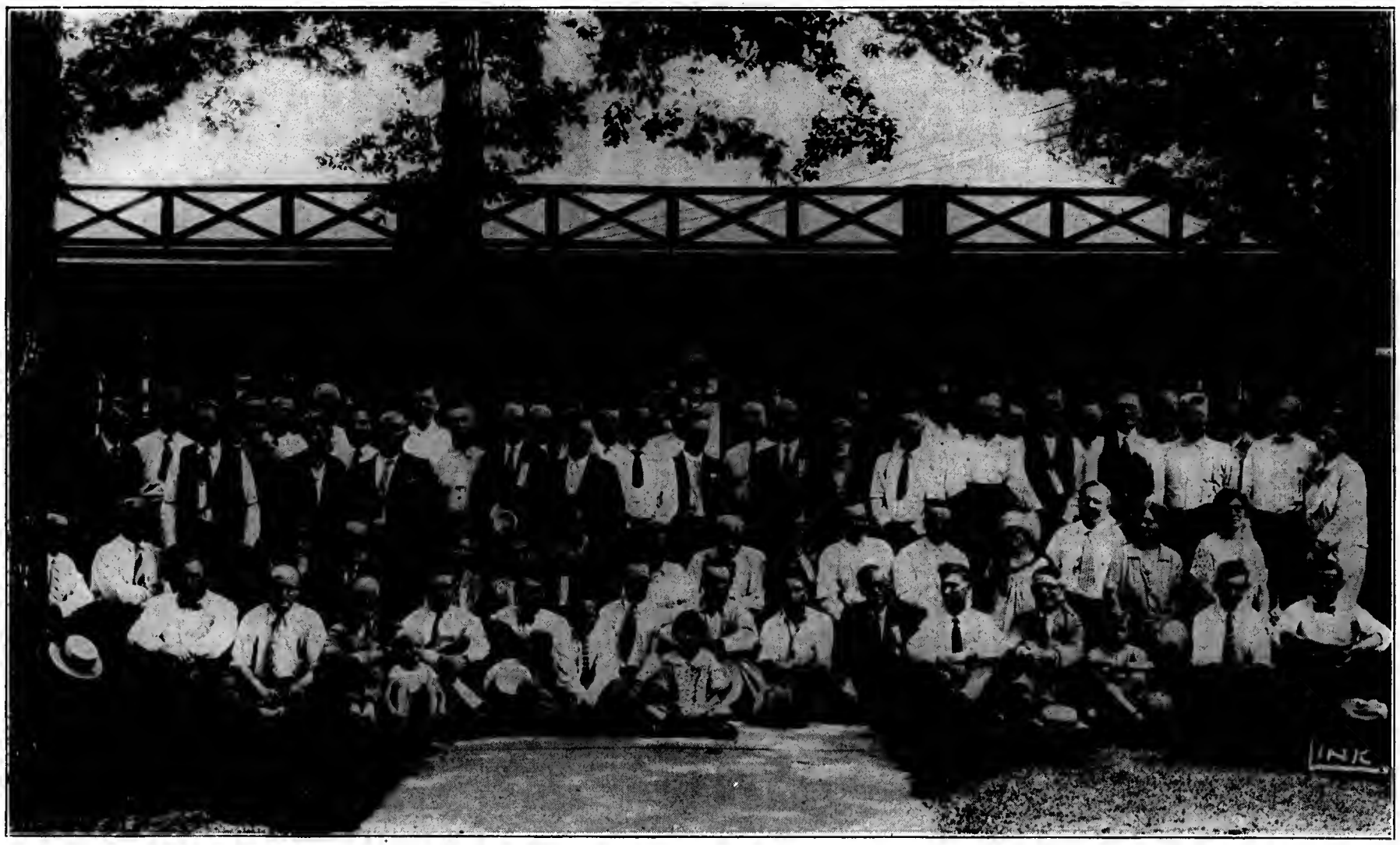
The annual beekeeping short course of the Beekeeping Division of the Department of Entomology, University of Illinois, was held during Farmers' Week, January 9-13, 1928. The attendance averaged about twenty per session, with 65 different beekeepers registered exclusive of high school and university students who reported apiaries as large as 300 colonies. The principal speakers besides the University force were Mr. E. L. Sechrist of the United States Bee Culture Laboratories at Washington, D. C.; Mr. Jay Smith of Vincennes, Indiana; Mr. Frank Pellett of Hamilton, Illinois; Mr. W. H. Snyder, Deputy Inspector of Decatur; Warren C. Ashley of Yorkville, and George Rasmussen of Urbana.

The beekeeping program offered by the Department of Entomology on Jan. 17 and 18, 1929, as a part of the Farm and Home Week of the Illinois College of Agriculture was quite well attended in spite of the rough weather which prevailed. A total of 15 and 21 beekeepers attended on the two days, respectively, 11 of these being repeaters, so they were apparently satisfied. The various topics on bee behavior and management were covered by M. D. Farrar of the State Natural History Survey and V. G. Milum, Apiculturist at the University.

This type of meetings will no doubt be continued in future years.

THE INTER-STATE BEEKEEPERS' MEETING

The Inter-State Beekeepers' Meeting was held at Dubuque on July 25th and 26th but the attendance, especially from Illinois, was not as large as was to be expected. Among the Illinois beekeepers present were N. A. Kluck and wife, Lena; E. S. Lake and wife, Lincoln; Forest Earle, George S. and H. V. Hyde, New Canton; C. W. Duerrstein and family, and Charles Knantz, Galena; E. L. McDowell, Hanover; Henry Price, Elizabeth; L. C. Dadant, Hamilton; V. G. Milum, Champaign, and A. L. Kildow, Putnam. The last three mentioned appeared as speakers upon the half-day Illinois program.



Inter-State Beekeepers' Meeting, Dubuque, Iowa, July 25-26, 1928

REPORT OF APIARY INSPECTORS MEETING SIOUX CITY, IOWA, FEB. 8 AND 9, 1929

(C. D. Adams, Madison, Wisconsin)

Meeting called to order by Dr. R. L. Parker of Kansas. Mr. J. V. Ormond of Arkansas was appointed temporary secretary. Dr. Parker read letters from a majority of chief apiary inspectors of the United States endorsing the proposed organization.

The following states were represented: Arkansas, J. V. Ormond; Colorado, R. G. Richmond; Illinois, A. L. Kildow; Iowa, A. D. Worthington; Kansas, Dr. R. L. Parker; Missouri, Arthur Allen; Nebraska, L. M. Gates; North Dakota, J. A. Munro; Ohio, Geo. DeMuth, representing C. A. Reese; Texas, T. W. Burleson, representing F. L. Thomas; Washington, D. C., W. J. Nolan; Wisconsin, C. D. Adams. Mr. C. L. Corkins expected to represent Wyoming but was busy at another meeting.

Mr. R. G. Richmond moved that we adopt no constitution and by-laws at the present time, but instead prepare a "declaration of principles." This was passed unanimously. The chairman then appointed R. G. Richmond of Colorado and they later submitted the following report.

The name of the organization shall be the, "Association of Apairy Inspectors of America". The object of the Association shall be to further the exchange of information between the apiary inspectors and to foster in the states and provinces represented by its membership such uniform apiary inspection practices as may be deemed advisable.

After a short discussion a motion was made and passed that the membership of the organization consist of the officials in charge of the apiary inspection of the various states and provinces of America and he or his duly authorized representative may sit and vote at all meetings of the Association.

The committee on nomination of officers reported the following:

Dr. R. L. Parker, Kansas—Chairman.
F. L. Todd, California—Vice Chairman.
C. D. Adams, Wisconsin—Secretary.

On motion these officers were declared elected to the respective offices.

A paper was read by Don B. Whelan, Secretary of the Nebraska Beekeepers' Association, giving the summary of a questionaire sent by him to the chief apiary inspectors of the various states. C. D. Adams was asked to give a short talk on the, "Area Clean Up Work in Wisconsin". The meeting then had an informal discussion on the subject of foul brood control methods. A committee was appointed to draft a set of rules embodying the conclusions arrived at as a result of the discussion.

On the morning of February 9th, the committee drafted the following resolution which was later adopted unanimously by all inspectors present.

Report of the Association of Apiary Inspectors of America in regard to certain features which we are in favor of incorporating into Apiary inspection laws.

BE IT RESOLVED:

1. That this Association meet with the A. H. P. League in its annual convention.
2. That colonies diseased with American foul brood should be burned upon their discovery by an inspector.
3. That we favor the "area clean up" plan.
4. That we favor the certification of bees and used bee equipment in interstate and intrastate shipments.
5. That the Bee Culture press continue its policy of careful selection for publication of articles dealing with various phases of bee diseases.
6. That we urgently request that the U. S. Post Office Department immediately impose regulations on the shipment of bees and used bee supplies in conformity with those now imposed upon the Express Companies in compliance with the various state laws.
7. That we are opposed to the compulsory registration of apiaries and the collection of a special per colony tax for the state inspection service.
8. That we favor the collection of apiary statistics for the aid of this organization and the individual inspection services.

C. D. ADAMS, Chairman,
R. G. RICHMOND,
J. A. MUNRO.

Later, on the same date, these rules were read to the American Honey Producers League meeting and approved by them without a dissenting vote.

The suprising and outstanding feature of the whole meeting was the absence of a dissenting voice on any of the important subjects under discussion.

Apiary inspection was begun in some of our states twenty-five or more years ago. Each beekeeping state began the work only when the conditions became unbearable by the beekeepers. Some times the work was assigned to some practical beekeeper in whom the beekeepers had confidence but in most cases the work was assigned to some already existing department of the state government. In other cases the newly appointed official communicated with the Beekeeping Laboratory at Washington and started the work under the instructions of the officials there. Some of the work was started along entirely original lines.

In former years each state passed an apiary inspection law without much regard to the laws of the adjoining states. In recent years there has been a decided tendency of the states to revise their laws to more or

less conform to those of the neighboring states. Practically all the states now, where beekeeping is of considerable importance have fairly satisfactory laws in regard to bee diseases, but the rub is to get sufficient appropriations to enforce the laws. A law without an appropriation to carry it out is of little if any value. To the best of our information Michigan takes the lead in appropriations for this work with Illinois probably second. The amount of these appropriations depends largely upon the aggressiveness of the state and local beekeepers' organizations.

At the Cincinnati meeting of the American Honey Producers Association the apiary inspectors from five or six states got together and considered the advisability of forming an association of apiary inspectors but nothing came of it. In the fall of 1928 Dr. R. L. Parker of Kansas, at the suggestion I believe of President C. L. Corkins, sent out a call for a meeting of the inspectors at the meeting which was held at Sioux City, Iowa. He not only sent the call but kept up an aggressive correspondence with the "powers that be" in the various states to get a representative attendance. Representatives of twelve states and one from the bee culture laboratory of the District of Columbia responded. The object of the meeting is given in the enclosed report.

Since this meeting letters have come to me from a number of Chief Apiary Inspectors not able to be present but who endorse every one of the resolutions. A representative of one state objected to the seventh resolution. This resolution was a surprise to some of us, but it was proposed and backed bv the states having had experience in attempting to enforce compulsory registration. Some of us expected some opposition on the first resolution but there was not a single representative there who volunteered a word in defense of the "shaking treatment" or any other treatment authoritatively advocated and almost universally practiced ten years ago. It may be well to add that several others were suggested but were not considered matters of importance.

The next meeting will be held at Milwaukee in 1930 where we hope to continue working for uniform policies and practices throughout the whole of America.

COUNTY ASSOCIATION ACTIVITIES FOR 1928

Champaign County Association

This association held no meetings in 1928 other than the stops included in the summer tour on August 2.

President—W. H. Force, Champaign.

Secretary-Treasurer—G. Rassmussen, Urbana.

Christian County Association

No meetings were held by this association but the apiaries of Frank Bishop and J. H. Bearden, next-door neighbor beekeepers of Taylorville were the scenes of interesting stops of the third day of the annual tour on August 3. The apiary of E. F. Berry near Taylorville was also visited.

President—E. F. Berry, Taylorville.

Secretary—W. H. Stumm, Edinburg.

Cook County Association

(A. D. Boal, Downers Grove, Secretary)

The eighth annual business meeting of this association, including the election of officers, was held on March 27th, 1928, at the Bismarck Hotel, Chicago. The weather was bad and only about twenty-five members were present.

Mr. A. L. Kildow, State Inspector, talked on inspection prospects and was followed by Prof. Bruce Lineburg of Lake Forest College who gave an interesting address on Spring Management.

During the summer field meetings were held at the apiaries of Mr. C. L. Duax at Justice Park, and Mr. M. G. Eldred at Ontarioville, Ill. The first was held on Saturday, June 23rd. The speakers were Mr. H. H. Root, General Manager of the A. I. Root Co., and Professor V. G. Milum, State Apiculturist and Secretary of the State Association. This was a most interesting meeting, both talks being most inspiring and bringing forth much comment from those in attendance. The meeting was rather poorly attended because of threatening weather.

The second meeting on September 8th, was an experience meeting in which several members took part. Both Mr. and Mrs. Eldred told their guests how they produced and marketed big crops of fine honey. There was a general discussion of fall management and marketing problems. This meeting was held on Saturday, September 8th and there were about fifty present.

On Saturday August 11th, about fifteen Cook and Du Page County Beekeepers journeyed to De Kalb as guests of the Northern Illinois Beekeepers' Reunion. An enjoyable afternoon was spent in listening to talks by various Northern Illinois beekeepers.

The last meeting of the year was held on February 20th, 1929 at the Bismarck Hotel with nearly one hundred in attendance. The speakers were Dr. H. E. Barnard, President of the American Honey Institute, Mr. F. B. Paddock, State Apiarist of Iowa, and Miss Malitta Fischer, Editor of the Food Department of Gleanings in Bee Culture.

Officers	1928	1929
President	Mrs. Hope E. Kerwin	E. M. Warren
First Vice Pres.	F. E. Briggs	H. S. Heise
Second Vice Pres.	H. S. Heise	Mrs. Eleanor Simmer
Third Vice Pres.	E. A. Meineke	Earl Wooldridge
Fourth Vice Pres.	Ed. Groh	E. J. McCormick
Fifth Vice Pres.	Gun Mozee	Wm. Bigel
Secretary-Treas.	A. D. Boal	A. D. Boal

This association held another meeting, not listed in the secretary's report, on Feb. 6, 1928 with an attendance of about one hundred. The speakers at this meeting were Mr. Frank C. Pellet of the American Bee Journal and Herbert J. Link, banker-beekeeper of La Porte, Indiana.

Mr. Boal reports that the ninth annual meeting and election of officers of this association was held at the Bismarck Hotel, Chicago at 8:00 P. M. Monday March 25, 1929 with about 50 members present. Mr. G. H. Cale of the American Bee Journal gave an interesting talk followed by a general discussion of Wintering and Spring Management.

DeKalb County Association

Secretary C. H. Tudor of this association reported a meeting on the evening of May 10th with Chief Inspector A. L. Kildow as the principal speaker of the evening. Mr. Morrill of Kane County also gave an interesting talk. About 50 were present at this meeting. On May 20th DeKalb County beekeepers held a picnic at the yard of Mr. Chris Holm near Geneva. A chicken dinner was served, the chicken being donated by our member, Porter Chamberlain. Inspector S. S. Claussen from Oregon gave a fine talk. Our president, Mr. Ritter, of Genoa and Secretary Tudor also aired their views on beekeeping. A large attendance and good time was enjoyed.

The Northern Illinois Beekeepers' Reunion was held at Tourist Park at De Kalb on Saturday August 11. An interesting program was offered according to various reports.

President—W. L. Ritter, Genoa.

Secretary-Treasurer—C. H. Tudor, De Kalb.

Edgar-Vermilion County Association

At a meeting of beekeepers held at the apiary of Bert O. Callahan of Vermilion Grove on September 13, this Association was organized with Mr. Callahan as President; Everett Ellis, of Chrisman, as Vice-President; and Dale Hester, of Ridgefarm, as Secretary-Treasurer. Mr. A. L. Kildow, State Apiary Inspector was present and gave a dis-

cussion of "Eradication of Foulbrood." V. G. Milum explained the benefits resulting from a local organization of beekeepers and acted as temporary chairman in the formation of this association.

This association held its first 1929 meeting at Danville on March 16, with V. G. Milum as the speaker.

Franklin County Association

This association held no meetings in 1928 but again showed some activity by a meeting at Benton on the evening of March 29, 1929. Those present decided to continue under the old arrangement with Mr. E. E. Glick, County Farm Adviser, acting as secretary. A. L. Kildow and V. G. Milum attended this meeting.

The surplus funds of the association are invested in bee supplies kept at the office of the Farm Adviser for sale to beekeepers desiring same.

Fulton County Association

This association held a meeting on April 21st. The principal business of which, according to Mr. Kildow who attended the meeting, was the reelection of the 1927 officers.

Grundy County Association

This association held its annual meeting at Fraternity Hall in Gardner on Saturday afternoon, February 11th. V. G. Milum discussed the Causes, Symptoms and Treatment of Bee Diseases. The election of officers resulted in the re-election of William Osborne, of Morris, Illinois as President and Mr. Ernest H. Davy of Morris as Secretary-Treasurer. The association decided to affiliate with the State Beekeepers' Association.

Hancock County Association

The beekeepers of this association apparently held no meetings in 1928, but Mr. M. G. Dadant of Hamilton has been active in keeping up its membership in the state association.

Henry County Association

(Elmer Kommer, Woodhull, Secretary)

My report as Secretary of our association will not be as good as it has been, owing to the fact that we have experienced almost a failure in crop which has caused a lot of beekeepers to lose interest but we think it will come back again when we get another honey year.

The past year was one that I term very peculiar, and it not only fooled the bees, but the beekeeper as well, for when the bloom came it had no nectar, and what little we did get was not the best of quality.

As for meetings, we held one field meeting at Geneseo, Ill. at the apiary of Mr. W. L. Myers who has a fine apiary of 50 colonies of bees in town. For speakers, we had the privilege of having H. C. Dadant

of Hamilton, Ill. and he spoke on "Behavior of Bees in Comb Building." We also had Mr. A. L. Kildow, Chief Inspector, at this meeting and he spoke on "Bee Diseases and Inspection Work." The day was a bad one as we hit a rainy day, but the beekeepers came out after the rain, and the attendance was fair considering the weather.

Our annual meeting was held at Cambridge on October 13th at the Court House when all annual business and election of officers was held. All old officers were reelected for another year. The Treasurer's report showed a gain in the Treasury over last year, even though our membership had fallen off some.

Our next meeting will be held sometime during the winter, or early spring when we will send in wax for our members for making up foundation.

The Honey Display at the County Fair was as good as ever and some very fine honey was displayed regardless of the poor year. The usual $50.00 was awarded to the winners.

The inspection work was not carried on as well as usual, on account of lack of funds for that purpose, but we hope more funds will be available next year so that a general inspection can be had in this county.

Iroquois County Association

The Iroquois County Beekeeper's Association met at Watseka on the evening of February 14th. V. G. Milum spoke upon the subject of Bee Diseases. The election of officers resulted in the choice of J. N. Koritz, Buckley, as president; H. L. Dunn, Onarga, as vice-president; and L. W. Wise, Watseka, as secretary-treasurer. The association

Iroquois County Beekeepers' Association Meeting, Onarga Sept. 22, 1928

passed a motion authorizing the affiliation of the Iroquois County Association with the State Beekeepers' Association.

This county was included in the itinerary of the first day of the annual tour on August 1 with stops at the apiaries of John Diercouff of Ridgeville, H. L. Dunn of Onarga and J. N. Koritz of Buckley with an evening program at Buckley.

This association held its fall meeting at the home and apiary of H. L. Dunn of Onarga on September 22, with a good attendance. V. G. Milum discussed the question of bee behavior and gave a brief demonstration of honey grading.

Jefferson County Association

This association was definitely organized at a meeting held in the Farm Bureau Office on July 6. V. G. Milum attended, explaining the benefits of an association and discussing the subject of bee diseases.

President—Xavier Kiefer, Belle Rive.

Vice-president—Roy Wooden, Mt. Vernon.

Secretary-treasurer—C. F. Anderson, Mt. Vernon.

On the afternoon of Saturday, March 30, 1929, this association held another meeting with a good attendance. Mr. A. L. Kildow and V. G. Milum discussed the subjects of bee diseases and spring management, respectively.

Jersey County Association

This association showed no activity for the year 1928. Mr. C. A. Mackelden, Jerseyville, is the acting secretary of the organization.

Jo Davies County Association

The Jo Davies County Beekeepers' Association met on January 28th at Galena. Deputy Inspector S. S. Claussen of Oregon, addressed those present on the subject of "Why Bees Swarm."

This association held its first 1929 meeting at the Court House at Galena on January 5th.

Kane County Association

(Ross R. Morrill, Secretary, Batavia)

During the year 1928 this association held five meetings and one field meeting. At the field meeting, which was held at Wing's Park, Elgin on Sunday July 29th, there was an attendance of 53. Several from De Kalb County attended. A "pot luck" supper was enjoyed. Talks were given by Chief Inspector A. L. Kildow and Dep. Inspector C. H. Tudor of De Kalb County.

McHenry County Association

(Ray Page, Secretary, McHenry)

McHenry County beekeepers to the number of 15 or 18 met at the Court House at Woodstock, Ill. on Saturday afternoon, May 12th, 1928. Mr. V. G. Milum, State Secretary and Mr. A. L. Kildow, Chief of the

Inspection Department of Apiaries of Illinois were present and gave some very good talks on beekeeping and bee diseases.

On July 29th, we were all invited to attend the annual picnic of the Kane County Beekeepers' Association at Wing Park, Elgin, Illinois, but unfortunately the attendance from McHenry County was very small.

McLean County Association

There are no reports of this association holding any meetings during 1928 other than that at the home and apiary of J. L. Wolcott of Normal at the beginning of the tour on August 1.

Mr. Wm. B. Brigham, County Supt. of Schools whose address is 1301 N. East St., Bloomington, is the acting secretary of the organization.

Mercer County Association

This county was included in the series of meetings of June 21 to 23 with a meeting on the former date at the home and apiary of the secretary, H. E. Miller of Aledo. An attendance of 25 to 30 beekeepers enjoyed the discussions by H. E. Dadant, A. L. Kildow, Elmer Kommer and Dow Ripley.

The annual meeting of this association was held in Aledo on Tuesday, September 4th at which time the following officers were elected:

President—G. W. Brown, Aledo.

Vice-president—H. U. Decker, Aledo.

Secretary—H. E. Miller, Aledo.

Treasurer—W. C. Egbert, Aledo.

Directors—A. N. West, Aledo; R. M. Greer, Joy; Charles Greet, Reynolds.

Montgomery County Association

(Wesley W. Osburn, Secretary, Butler)

The most important beekeeping event in Montgomery County in 1928 was the visit made us by the Second Annual Tour of our State Association. We combined our annual field meeting with the visit of the tour, and through the co-operation of Secretary Milum, the event was well advertised among the beekeepers of our county. The result was a very gratifying attendance of interested beekeepers to greet the talented speakers the tour brought to us on August 3rd, at the apiaries of Messrs. O. W. Kennett, Ohlman, and Frank Zadel, Witt. Mr. Zadel was host to the largest attendance of the tour, we understand, and we are proud to rest our reputation for hospitality on the welcome accorded us by his good wife and himself, assisted by Mr. and Mrs. Wolcansek. Mr. Wolcansek is our other member in Witt. For other details we refer you to the repotrs of the State Tour published in the September American Bee Journal and the November and December issues of Gleanings. (The latter is reprinted in this report.)

We maintained our even dozen membership, and while the honey harvest was nothing extra, our members had fair crops, and the colonies went into the winter in good shape. Thanks to the efficient work of our deputy inspector, Mr. O. W. Kennett, the danger from disease appears to be less than formerly. Our inspector was taken from service last summer, on account of the lack of funds but we are hopeful that he will be restored to active duty for '29, as an insurance for the continuance of these conditions. One does not cancel his fire insurance policy because he had no fire last year.

This association held a meeting at the Farm Bureau office at Hillsboro on April 11th, 1928. At this meeting O. W. Kennett, Ohlman, was elected president and Geo. H. Hill, Hillsboro, vice-president.

Another meeting was held at 7:30 P. M. June 4th, 1928.

Each member of the Montgomery Association is given a membership card for each year's membership in the local association when his dues are paid. The cards bear the year imprinted in large colored figures.

The Ogle-Lee County Association

(Elizabeth Ordnung, Secretary, Oregon)

Two meetings were held during the year, on May 9th and September 19th. Both were all day meetings and were held at the Oregon Coliseum. At the former meeting it was decided to combine Ogle and Lee Counties in the Association, to be called "The Ogle-Lee County Beekeepers' Association." Chief Inspector A. L. Kildow was present and gave an interesting talk on the necessity of thorough work in producing honey and keeping down disease. Other interesting discussions were held. Four members were added to both the Local and State Associations.

At the September meeting the officers for the previous year were re-elected. Interesting and instructive discussions were held. Those present from a distance were Chief Inspector A. L. Kildow of Putnam, E. M. Warren of Chicago, C. H. Tudor of De Kalb and Ross Morrill of Batavia.

President—Geo. L. Sauer, Polo.
First Vice-president—Chas. Mon, Polo.
Second Vice-president—Edgar Confer, Lindenwood.
Third Vice-president—E. H. Stanley, Dixon.
Secretary-treasurer—Elizabeth Ordnung, Oregon.

Peoria County Association

The only 1928 activity recorded for this association is the final meeting of the annual tour on the afternoon of August 4th at the orchard apiary of Schoff Brothers near Peoria.

The beekeeping fraternity as well as this association lost a valuable friend and cooperator with the death of its secretary, Mr. A. E. Johnson of Peoria on January 9th. Mr. Johnson was also a former vice-president of the State Association.

Piatt County Association

(Emory Warner, Secretary, Monticello)

We held our annual meeting in Monticello, January 7, 1928, with a good crowd in attendance. Prof. V. G. Milum gave a talk on Spring Management, also showing slides which were enjoyed by all. The following officers were elected:

President—Searel Watts.
Vice-president—E. C. Wyne.
Vice-president—E. A. Larson.
Secretary-treasurer—Emory Warner.

Our summer meeting was held in conjunction with the tour and we all enjoyed Mr. Root's talk very much.

On February 2, 1929, this association held its annual meeting and election of officers as follows:

President—C. W. Brown, Monticello.
Vice-president—Scott Piatt, Monticello.
Secretary-treasurer—Emory Warner, Monticello.

Richland County

The beekeepers of this county are reported as having held a meeting at Olney on Friday, April 20th. Apparently no organization was perfected.

Rock Island County Association

The series of June 21 to 23 included this association with a meeting on the latter date at which H. C. Dadant and A. L. Kildow were the chief speakers. This was an all-day meeting with a basket lunch at noon, at Paradise Farm owned by Dr. R. C. J. Meyer of Hillsdale.

This association held its annual meeting at the S. F. Peterson (Secretary) Apiary, East Moline, on Monday, September, 3, with an attendance of about thirty. Mr. George Hartman, of Freeport, was the principal speaker and according to the secretary's report gave some good pointers on beekeeping management. The officers of the association are: President, Dow Ripley, Illinois City; Vice-president, H. G. Frymier, Carbon Cliff; Treasurer, Thomas J. Hayes, Taylor Ridge, and Directors, T. C. Hoefer, Taylor Ridge; C. F. Nelson, Hillsdale; and J. W. McKendrich, Silvis.

Saline-Gallatin Association

(Alvin Bell, Secretary, Ridgway)

This association held four meetings in 1928, the first at Mr. Billman's, at which the officers elected were H. W. Wilson, Eldorado, president, K. E. Moye, Omaho, vice-president, and Alvin Bell, secretary-treasurer. Louie Vannis was recommended as inspector. Louie Vannis had some combs of American foulbrood and explained it to the members. The next meeting was at the apiary of H. W. Wilson, Eldorado, queen breader, with 102 nuclei with young Golden Italian queens in them.

The third meeting was at Alvin Bell's at Ridgway on September 5th, with V. G. Milum as the speaker. This meeting was finished up by a watermelon feast. The fourth meeting, on September 28, was at the apiary of Louie Vannis.

Saline County had only two yards with American foulbrood in 1928.

This association held its 1929 annual meeting and election of officers on March 29 at the Equality Township High School. A good representation of beekeepers augmented by some 25 or 30 boys from the agricultural classes at Equality and Eldorado gave a total attendance of over 50. Mr. A. L. Kildow and V. G. Milum were the speakers at this meeting. The 1928 officers were reelected.

Shelby County Association

Through the efforts of Mr. Frank Koontz of Stewardson, the beekeepers of Shelby County organized on Monday, March 12. The election of officers resulted in the choice of Frank Koontz for president; John Haslan, Jr., Mowequa, as vice-president; William Rincker, Stewardson, as second vice-president, and C. E. Hill, Windsor, as secretary-treasurer. According to Mr. Hill, "Mr. W. H. Snyder gave an interesting talk on Bee Behavior, Care of Bees, and Foulbrood, later urging our association to join the state association, telling the benefits of same."

The association held another meeting, on Thursday, April 12th, at Shelbyville, at which time Mr. Snyder demonstrated transferring of bees at the home of Oscar Knearem. A constitution was adopted after which seventeen members paid their dues for one year.

This association also held another meeting on Saturday, May 12th, and was included on the second day's schedule of the annual tour on August 2nd, with visits to the apiaries of John Haslan, Jr., of Moweaqua and Herbert Howell of Findlay as well as a well attended meeting at Shelbyville in the evening.

Northwestern Independent Association

An association with the above name was organized at Freeport late in 1928 with twelve charter members also affiliating with the state association. Mr. Fred Meinen of Baileyville is the secretary.

Stephenson County Association

There are no reports of any 1928 activities of this association. Its membership is being kept up by the secretary W. H. McCaffrey of Freeport.

Warren County Association

(Glenn Glass, Secretary, Cameron)

The year 1928 was a very poor honey year in Warren County. The production this year was about one tenth of last year's yield. A great many swarms have gone into the winter with insufficient stores and the indications are that the spring loss will be heavier than usual. The retailers had to depend almost entirely on western honey this year as

most of the bee men were able to dispose of their stock to their regular customers who came to their apiaries for it. Our annual meeting and election of officers was held at the home of our bee inspector Mr. Wallace Smith. The two main speakers of the day were Mr. Dadant of Hamilton whose subject was Races of Bees and Mr. Frank C. Pellet who spoke on Location and Management of Bees. Their talks were very instructive and interesting and were appreciated by all.

Our retiring president made some remarks about his observations of Carniolans in comparison with Italians.

Mr. A. J. Quinley of Cameron was elected president for the coming year. Mr. H. W. Vantine of Monmouth, Mr. Joe Pittman of Roseville, and Mr. John Kenan of Galesburg were elected vice-presidents and Glenn Glass of Cameron was reelected secretary-treasurer.

Whiteside County Association

(Lou Bradley, Secretary, Morrison)

This association held a meeting at the apiary of C. C. Bowen of Lyons on August 15th.

The annual meeting and election of officers was held at Morrison, Ill. on December 27, 1928. Owing to bad roads and weather, the attendance was very poor. Mr. Roselieb, inspector, made a report of his inspection work and gave a very interesting talk on his visit to the state meeting.

Officers elected were as follows:

President—W. G. Lawrence, Fulton.

Vice-president—H. C. Rodemacher, Morrison.

Secretary-treasurer—Lou Bradley, Morrison.

No one wanted the responsibilities of the inspection work, so no one was recommended, but Mr. Lawrence who was not present at the meeting was suggested by some of the members.

Will County Association

A number of beekeepers of this county gathered at the home of Mrs. Vera Winkler of Joliet for an evening meeting on Friday, May 11th. Chief Inspector Kildow attended this meeting.

On June 9th, this association held a meeting at the home and apiary of George Lynn, at Lockport. A number of the beekeepers first assembled at the home of Mrs. Edward Winkler at Joliet and then drove to the meeting place. After inspecting the apiary the crowd was called together to listen to the speakers, Mr. A. L. Kildow and V. G. Milum. Mr. Kildow spoke upon the question of eradicating bee diseases and especially urged that every beekeeper should become his own inspector in order to eliminate unnecessary loss from bee diseases because of not knowing the nature of the disease.

Williamson County Association

A meeting of the beekeepers of this county was scheduled for Saturday, April 21st, but no further information is available.

Woodford County Association

This association held its annual meeting and the election of officers at the High School at Eureka on Friday, February 10th. In addition to the beekeepers present a large number of high school students were dismissed from classes to attend the meeting. V. G. Milum of the State University gave an illustrated lecture on Useful Body Structures of the Honeybee with some additional comments on spring management. Mr. A. L. Kildow, State Apiary Inspector, of Putnam, Illinois, was present and gave a few words of advice to the High School students. Mr. Benjamin Fisher gave a report of his inspection work in which he pointed out that American foulbrood had been decreased from about 10% of infection when he first started the inspection work to slightly more than 1% at the present time. The election of officers resulted in Mr. J. P. Schied of Eureka, who is the High School Agricultural Instructor and Mr. A. E. Thomas of Secor, being reelected as President and Secretary, respectively.

The Woodford County Association held its regular Fall meeting at the Eureka High School at 7:30 P. M. on Friday, October 5th. Benjamin H. Fischer of Roanoke reported upon the condition of bees, in Woodford County, Lawrence Nichols of Eureka discussed races of bees, Kenneth Dorward reported upon exhibits at fairs, and Alfred Thomas, Secretary, of Secor, spoke upon the organization of the bee colony. Mr. W. H. Snyder, State Deputy Inspector, also spoke upon the history of the honeybee. An attendance of fifty beekeepers is reported at this meeting, it being an enthusiastic one, in spite of a poor crop having been harvested during the past season.

This association held its annual meeting for 1929 at the Eureka High School at 7:30 P. M., February 21st. J. P. Scheid of Eureka and A. E. Thomas of Secor were reelected as President and Secretary-treasurer, respectively.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF APIARIES FOR YEAR ENDING JUNE 30, 1928

(A. L. Kildow, Putnam, Illinois)

In submitting my Annual Report for the year ending June 30th, 1928, I will simply give a summary of the work.

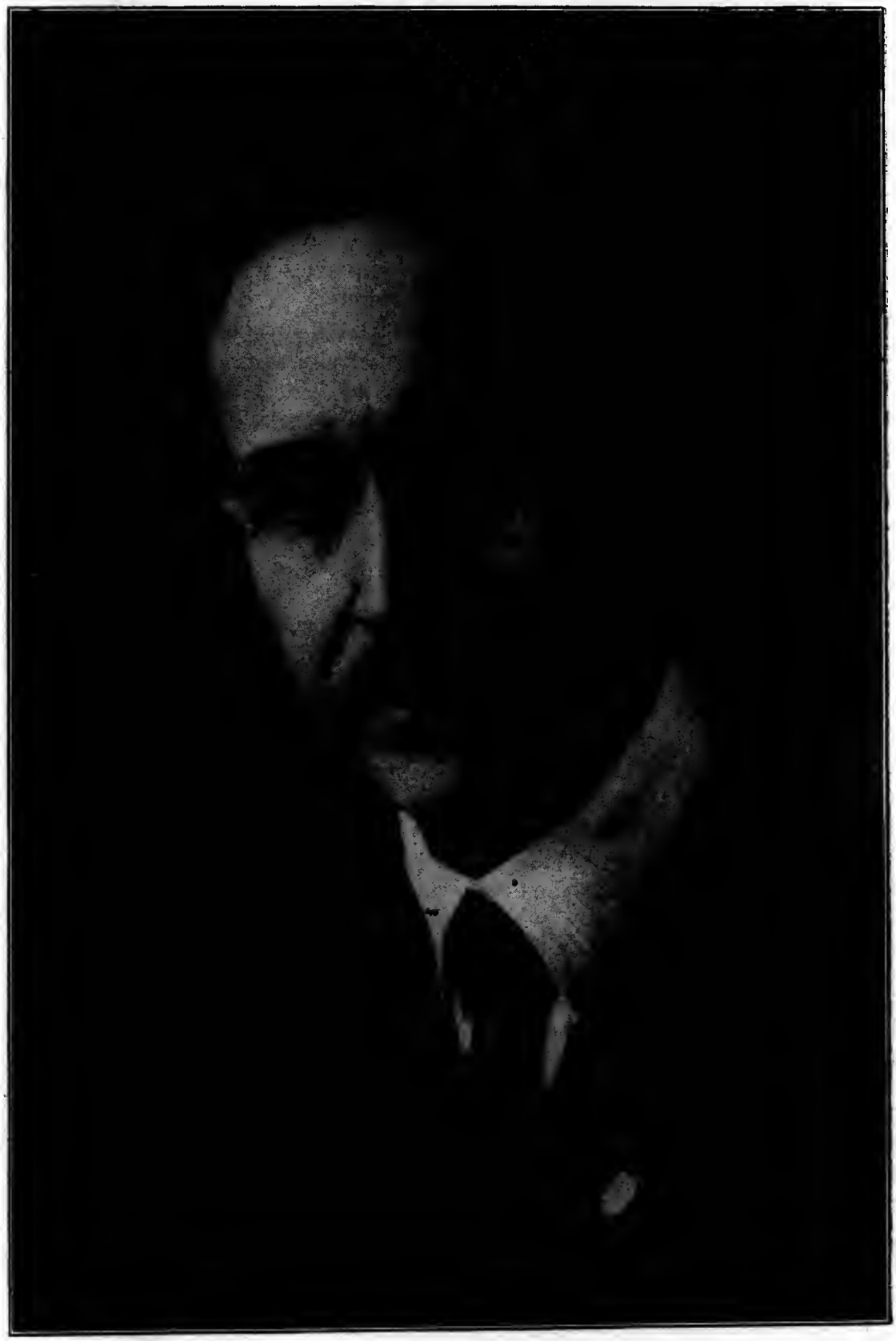
We visited 6950 apiaries, with 82379 colonies, of which 777 apiaries and 4210 colonies were found diseased, and 1592 were destroyed, while 825 colonies were treated. In the apiaries where the beekeepers were careful and practical, the diseased colonies were left for the owner to treat by following out the instructions of the inspector.

The past year was one of unusual activity, commencing July 1st with one of the heaviest honey flows that this State has ever had. There was an unusual demand for inspection which practically kept all inspectors on the go and ate into our appropriation at a rapid rate. This unusual demand was unexpected, from the fact that our reports from a number of localities showed that they were practically clean, and it was our judgment that the money that would be used for those localities could be used in other places.

As a whole the south half of the State was so well under control that we concluded it would be safe to cut our appropriation. The cutting down of the appropriation, however, proved to be a mistake, as the demand for inspection increased instead of falling off and ran us short of funds, so that on May 21st I called off inspection work in the south end of the State, and on the 24th by orders from the Department of Agriculture, I called a halt on all inspection work except emergency cases. While we have done very little inspection work since May 24, we have accomplished far more than in any previous year.

The past few months there has been considerable talk and many questions asked as to what has been done with our appropriation. Certain localities want to know why they are not getting service, and it appears that some think when an inspector is appointed it means a steady job or a permanent position. This is not the case as we only have 7 Civil Service men, all others are temporary. Then we have some beekeepers in Illinois that depend on the inspector to call at their apiary once or twice a year and tell them whether or not their bees are clean. This should not be, the inspection service was created to educate the beekeeper in detecting foulbrood, in methods of eradicating it, to make them better beekeepers, and not to take care of or run their apiaries for them.

The educational work consisted of Bee Meetings, Field Meets, Conventions and Inspection Work. The various counties held field meetings, some of them having regular monthly meetings to transact the apiarian work and discuss the difficult problems. Other counties seeing the benefits of organization in their sister counties, have formed organizations of their own, that they might improve the condition of apiculture and eradicate disease.



MR. A. L. KILDOW, PUTNAM, ILLINOIS
State Inspector of Apiaries

The field meets were often attended by beekeepers of several counties. One meeting that should have special mention was the Interstate Meeting of Iowa, Minnesota, Wisconsin, and Illinois which was held at Hamilton, Illinois, August 9, 10, 11, 1927. This meeting was also attended by beekeepers from other States.

Then in December we had the State Convention at Springfield. All these with the work of the inspectors is for the purpose of eradicating foulbrood, and educating the beekeepers in the best and most profitable manner to handle their bees.

(Signed) A. L. Kildow, Chief Inspector.

CONDENSED REPORT OF DEPUTY APIARY INSPECTORS

Illinois—July 1, 1927 to June 1, 1928

Inspector	Counties	No. Colonies	No. Diseased	Per Cent
*Duerrstein, C. W.	Jo Davies	2381	136	5.7
*Schwinn, G.	Stephenson	2291	65	2.4
*Claussen, S. S.	Winnebago, Carroll, Ogle	4179	501	11
Bryant, E. J.	McHenry, Lake	2542	347	13
Enlow, R. N.	Lake	105	33	31
*Roselieb, Roy	Whiteside	1129	29	2.5
*Tudor, C. H.	De Kalb	1730	242	13
*Morrill, R. R.	Kane, DuPage, LaSalle	944	125	13
Wallanches, Wm.	Du Page (?)	861	95	11
*Wooldridge, J. R.	Cook	55		
Young, C. W.	Cook	1187	17	1.4
Prill, Fred	Cook	486	19	3.9
Haan, J. Frank	Cook	872	66	7.6
Wooldridge, R. E.	Cook	241	32	13
		(104)	?	?
Bigel, Wm.	Cook	364	38	10.4
Bodenschatz, J. A.	Cook	643	46	7.1
Duax, C. L.	Cook	139	17	12.2
Ripley, D.	Rock Island, Mercer	566	31	5.4
Kommer, E.	Henry	946	69	7
Pierce, C. L.	Bureau, LaSalle	4291	35	.8
O'Brien, J.	Kendall	1389	42	2.2
*Anderson, C. J.	Grundy	958	52	5.4
Schutz, M.	Will	899	65	7.2
*Huessner, V. S.	Will	877	67	7
Long, J. W.	Henderson	644	41	6.3
Smith, W. R.	Warren	453	34	7.5
Bell, B. F.	Peoria	885	76	8.5
Fischer, Benj.	Woodford	407	6	1.4
Foltz, A.	McLean	1096	0	0
*Henricks, J. T.	Livingston, Ford, etc.	2741	147	5.3
Koritz, J. N.	Iroquois	434	39	8.9
Watt, G. R.	Hancock	64	0	0
		172		
Belt, F. R.	Fulton (?)	328	56	14
Heldt, E. C.	McLean	1269	84	6.6
Rittler, E. W.	Adams, etc.	433	50	11
Rose, Clifford	Schuyler	2398	154	6.4
King, H. L.	Cass, Menard, Morgan Sangamon	1903	55	2.8

Inpector	Counties	No. Colonies	No. Diseased	Per Cent
Tyler, S. A.	Logan, etc.	1315	26	1.9
Snyder, W. H.	Macon, etc.	7136	141	1.9
Warner, E.	Piatt	2822	55	1.9
*Force, W. H.	Champaign, etc.	3807	85	2.2
Mackelden, C. A.	Jersey	2073	0	0
*Kennett, O. W.	Montgomery, etc.	3020	98	3.2
*Bishop, F.	Christian, Shelby	622	16	2.5
Smith, P.	Moultrie, Douglas	1274	21	1.6
*Annear, R. I.	Randolph, Perry	1953	88	4.5
Meredith, R. C.	Jefferson, Franklin	2573	20	.7
Kelley, O.	Williamson, etc.	6201	4	.06
Vannis, L.	Saline, Gallatin	1562	4	.2
	Total	77526	3517	4.5

Note: This table supplied by Chief Inspector, A. L. Kildow, but rearranged by the editor according to tiers of counties from northern to southern Illinois.

* These inspectors furnished separate reports printed in the following pages.

REPORTS OF DEPUTY INSPECTORS FOR 1928

Jo Davies County

(Deputy P. W. Duerrstein, Galena)

For the year 1928 I started work on May 1 and visited 48 apiaries, consisting of 920 colonies. I inspected and examined 611 colonies, and found 42 infected with American foulbrood. These colonies were destroyed by burning, done by the owner and myselt. All of this work was done in Jo Davies County. The time was short as I was called off about May 24 and could only work in infected territories. There should have been more work done as the south and western half of my territory was badly infected with foulbrood two years ago, and I was not able to get over all this territory this year.

There are a number of beekeepers I have heard of and have never been at their apiary. In this territory I have reduced foulbrood infection down to less than one-half and hope I will be allowed more time so as to make a real clean up.

As the fall flow was not very good bees that were not provided with stores have gone into winter in bad condition, and if spring stimulation is not done promptly there will be heavy loss by dwindling and starvation.

Stephenson County

(Deputy George Schwinn, Orangeville)

During the year '28, up to July first, when inspection work ceased for lack of funds, I inspected 256 colonies of bees. Of these 31 had A. F. B., the owner in every case agreeing to treat his bees. Owing to stopping of work I did not re-inspect, to see what success or failures they made of it. I expect some of them did not treat at all, which is all the better, as they would only make a mess of it. I did not get to all yards where disease was found in '27 as there was not enough time, owing to bad roads and weather.

Carroll, Ogle, Winnebago Counties

(Deputy Inspector S. S. Claussen, Oregon)

I inspected a total of 2083 colonies of which I burned 302 that had A. F. B. I found a few with E. F. B. which were treated, some had new queens put in.

After the inspection work let up, I still inspected 280 colonies where owners wanted them inspected and paid me for the work themselves. Out of these 280 colonies 18 were found to be foul.

Most of my work was done in Ogle and Carroll and some in Winnebago counties. Winnebago needs a lot of inspection. Other

counties are getting pretty well cleaned up if people will only keep them that way, but there are so many careless beekeepers.

Whiteside County

(Deputy Roy Roselieb, Prophetstown)

The following is my summary report of 1928:

Apiaries	Colonies	E. F. B.	A. F. B.	Days
121	905	46	25	16

In addition to this I put in two days on research of four diseased apiaries.

The bulk of the diseased colonies were burned, although some strong colonies with little disease were treated by me in case of A. F. B. and by the owners if E. F. B.

I found on inquiry that around 75% of the E. F. B. infected colonies were wild swarms caught in decoy boxes the year before.

The spread of A. F. B. can generally be attributed to the careless beekeeper.

DeKalb County

(Deputy Carl H. Tudor, DeKalb)

My report on inspection work for the year 1928 does not show a large amount of work done owing to the fact that money was shy. I visited 93 yards with a total of 1887 swarms. I inspected 1203 colonies and found 267 to have A. F. B. One hundred and nineteen were burned, the others treated. I only found two swarms infected with E. F. B.; these were requeened. I find that inspection work is helping the beekeeper and that disease is not as plentiful as a few years ago. There are a few careless ones that seem to spread A. F. B. and they are not willing to help clean up. But the fire soon gets them; about the second year they are done in my line.

Kane, DuPage and LaSalle Counties

(Deputy Ross R. Morrill, Batavia)

My work for the year 1928 is as follows:

Eighteen and one-half days of inspection, 107 apiaries visited, 911 colonies inspected, 108 colonies diseased with A. F. B., 91 burned, remainder treated by inspector or owner.

In Kane and DuPage I found very little disease. In LaSalle I found one yard of 50 colonies all of which were diseased.

In the city of Aurora I found two yards where all bees had died with A. F. B. The States Attorney furnished me a truck and helper and a beekeeper helped and all fixtures and combs were hauled to the city crematory and burned. This should stop the spread of disease in this city.

DuPage County

(Deputy Wm. J. Wallanches, Downers Grove)

During the year 1927* I inspected 985 colonies in 160 apiaries. In 39 apiaries I found 103 diseased, 50 colonies of these were burned, and 53 were treated. Also located a few colonies of European foulbrood and proper instructions were given in treating the diseased.

I found all my parties very agreeable and willing to co-operate with me and that a little enlightenment on bee culture increases the interest of the small beekeeper. I inspected about three-fourths of the county; the remaining northwest part was not inspected on account of being late in the season.

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* Too late for 1927 report.

Cook County

(J. R. Wooldridge, Chicago)

I am submitting the following report of inspection of Apiaries in Cook County for the year 1928.

There were 238 Apiaries visited, containing 1428 colonies of which 105 colonies were found to be infected with A. F. B. located in some 51 different yards. Many of the 105 colonies infected were given the fire treatment at time of inspection. There are still 36 A. F. B. reports in my office awaiting action. This list is made up of colonies that the deputies considered strong enough at the time of inspection for treatment, which no doubt was done by the owner, and a portion of these are now clean.

Regardless of what may have been done at time of inspection, a duplicate notice of all apiaries inspected and diseased are filed promptly in my office, this gives me the opportunity to check on the inspector as to his efficiency and to know personally that the work is done per the State's instructions.

Generally speaking, the beekeepers of Cook County have become educated to know that the Inspector comes not to destroy, but to save them financially and place them on the road to success.

The organization in Cook County for Apiary Inspection is rather hard to evade once a beekeper is listed, life becoming almost unbearable until he thoroughly cleans his yard of all diseases; by this time the beekeeper has become so interested that he suddenly remembers several others keeping bees in his locality and insists that they receive inspection at once. The inspector thanks him for the information and assures him he will act promptly on his suggestions.

Unfortunately last spring we had most unfavorable weather for handling bees and credentials were not issued to the deputy inspectors until about the middle of May and the work was discon-

tinued in a few days on account of the finances, hence, our poor showing for the year 1928. This is no reflection on our deputy inspectors here as they are all well qualified for this service.

I would be pleased if the law were more rigidly enforced along the north border of Cook County. There seems to be quite a traffic in moving bees by auto truck without Health Certificates from Wisconsin and our Northern Counties. I located one apiary of 118 colonies moved by truck originating in Wisconsin having no Health Certificate but found clean. Another apiary of 60 colonies, 40 A. F. B., was moved from Lake County by truck without a Health Certificate.

The railroads require a Health Certificate before bees are acceptable for shipment and I have not heard of any one holding a Health Certificate from Cook County having any trouble unloading bees in Wisconsin. You can readily see how helpless we are so long as these conditions exist.

Grundy County

(Deputy C. J. Anderson, Morris)

Number of days inspection	11
Apiaries inspected	65
Colonies inspected	715
Apiaries with American foulbrood	8
Colonies with American foulbrood	45
Colonies treated	20
Colonies burned	18

The above report covers the period from March 20th to June 19th, 1928.

The first part of the honey flow was too wet and the last most too hot so we got about half of the sweet clover flow. The weather was right for the fall flow. Asters were to be seen everywhere and stayed in bloom the full limit so bees went into winter quarters good and strong with food of fall flowers. My bees averaged 60 pounds per colony. The white clover in the pastures and the sweet clover got a good start this fall and looked the best I have seen it so I look for more honey per colony next year.

Will County

(Deputy Valentine W. Heussner, Lemont)

The season of 1928 has been somewhat disappointing. Much work from the previous year had remained to be done. The spring weather conditions were very unfavorable for bee inspection work. Then on May 24, notice was received from Chief A. L. Kildow to close up the work of inspection, as the money for the present year had been used up. Hence, I am sorry to say, the year 1928 has passed with little or nothing accomplished in my respective county.

This, together with almost a complete honey crop failure, ranging from nothing in many apiaries, to 30 pounds as the high mark, has discouraged many beekeepers in this locality. But all are looking forward for a brighter, and more prosperous coming year.

Iroquois, Livingston, Ford, McLean and Kankakee Counties

(Deputy J. T. Henricks, Chatsworth)

	Total Colonies	No. Diseased A. F. B.	No. Treated	No. Burned	No. Box Hives
Iroquois	1024	43	2	41	1*
Livingston	403	5		5	5
Ford	235	4		4	
McLean	83				
Kankakee	160	5		5	
Total	1905	57	2	55	6

* Box hives were transferred.

I am sending the Total Report for 1928 and a few words in connection therewith as follows:

As the inspection work was cut short for 1928 there was some interference with my plans for the season. I have a plan that any bees in trees and buildings shall either be gassed or trapped out to do away with these swarms that are only a menace to any beekeeper. This is what we have to look forward to especially wherever there has been foulbrood, as I have eliminated swarms in trees and buildings and have found foulbrood among some swarms where it was the least expected.

Nineteen hundred and twenty-eight has been a somewhat slow season for our bees, but at that I am living in hopes for a bigger crop of surplus in 1929 as a prophet and a hobby in beekeeping.

Champaign County

(Deputy W. H. Force, Champaign)

From July 1st, 1927 to June 1st, 1928, I inspected 3807 colonies. Of this number there were found 85 diseased colonies.

Co-operation and larger attendance at beekeepers' meetings are the fundamentals in better beekeeping.

Montgomery County

(Deputy O. W. Kennett, Ohlman)

In the year 1928 I visited 116 apiaries totaling 1485 colonies of bees. I found 65 colonies affected with A. F. B. and 3 with E. F. B. These were found in 27 different yards. I found 44 colonies in box hives.

In my experience I find very few beekeepers that would know a case of foulbrood if they should see it. It is my opinion that all inspectors should be provided with some sort of sample case so he could carry a sample of the various kinds of bee diseases with him so he could show and familiarize beekeepers with it and how to detect the disease when it makes its appearance. By this method I feel sure that the inspectors could do much good. My idea is to teach each and every beekeeper to be his own inspector. Of course anyone who has such sample in his possession must remember that precaution must be used.

I come in contact with quite a number of beekeepers that don't believe there is such a thing as foulbrood. If I know for sure where I am going to be in the evening after my day's work is done I invite beekeepers to call on me so that I can talk bees and bee diseases with them. I am sure a lot of good can be done in this way. Of course in extending such an invitation it is important to specify the time you will have to spend on such occasions, for I have found myself going to bed after midnight. In this way I get to talk to many beekeepers that I otherwise would not get to talk to, especially during busy seasons.

Christian and Shelby Counties

(Deputy Frank Bishop, Taylorville)

Number of apiaries inspected in 1928	18
Number of colonies examined	400
Number of diseased colonies found and burned	9

Perry and Randolph Counties

(Deputy Roy I. Annear, Mulkeytown)

My inspection from July 1st, 1927 to July 1st, 1928, in Perry and Randolph Counties covered 1749 colonies of bees. I found about 3% diseased with American foulbrood. Most of these have been cleaned up by myself; some were burned and some transferred. But it seems impossible in some localities to keep the yards clean, especially close to towns or cities where honey is shipped in from this state and other states. Beekeepers as a rule are not careful enough in their own yards with American foulbrood. We must all be careful, examine all colonies at least three or four times each year and if you have any disease in your yard, don't shift combs and supers.

STATE LAW ON BEE DISEASES

DESCRIPTION AND TREATMENT

Illinois Department of Agriculture

S. J. STANARD, Director

SPRINGFIELD

APIARY DIVISION

A. L. KILDOW, Chief Inspector

PUTNAM, ILL.

CIRCULAR NO. 261

NOVEMBER, 1927

The following material relating to bee diseases has been copied from Circular No. 261 (November, 1927), Illinois Department of Agriculture, at the suggestion and by permission of A. L. Kildow, Chief Inspector, Putnam, Illinois.

(Prepared by A. L. Kildow, Chief Inspector, Putnam, Ill.)

This bulletin is published especially to acquaint the public with the destructive bee diseases which are prevalent in the State and to show methods of controlling them. It is not the purpose of the state law to require the destruction of property, but on the contrary to conserve the property of beekeepers as much as possible and to place beekeeping on a paying basis. The owners of bees should do all in their power to eliminate bee diseases, and it is to the interest of every beekeeper, when disease is found among his bees, to observe and carry out treatment recommended. Some of the largest beekeepers in the State have had to fight bee diseases, and lessons thus learned have made them better beekeepers.

The treatments in this bulletin are stated as concisely as possible in order that no one will be confused. If there is any doubt as to whether or not disease exists, write to the State Bee Inspector for assistance.

STATE LAW ON BEE DISEASES

An Act to prevent the introduction and spread in Illinois of foulbrood among bees, providing for the appointment of a State Inspector of Apiaries and prescribing his powers and duties.

WHEREAS, The disease known as foulbrood exists to a very considerable extent in various portions of this State, which, if left to itself, will soon exterminate the honey-bees; and

WHEREAS, The work done by an individual beekeeper or by a State Inspector is useless so long as the official is not given authority to inspect, and, if need be, to destroy the disease when found; and

WHEREAS, There is a great loss to the beekeeper and fruit growers of the State each year by the devastating ravages of foulbrood;

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly.* That the Governor shall appoint a State Inspector of Apiaries, who shall hold his office for the term of two years, and until his successor is appointed and qualified, and who may appoint one or more assistants, as needed, to carry on the inspection under his supervision. The Inspector of Apiaries shall receive for each day actually and necessarily spent in the performance of his duties the sum of Four Dollars to be paid upon bills of particulars certified to as correct by the said State Inspector of Apiaries, and approved by the Governor.

SEC. 2. It shall be the duty of every person maintaining or keeping any colony or colonies of bees to keep same free from the disease known as foulbrood and from other contagious diseases among bees. All beehives, bee fixtures or appurtenances, where foulbrood or other contagious or infectious disease among bees exist, are hereby declared to be nuisances to be abated as hereinafter prescribed. If the Inspector of Apiaries shall have reason to believe that any apiary is infected by foulbrood or other contagious disease, he shall have power to inspect, or cause to be inspected from time to time, such apiary, and for the purpose of such inspection he, or his assistants, are authorized during reasonable business hours to enter into or upon any farm or premises, or other building or place used for the purpose of propagating or nurturing bees. If said Inspector of Apiaries, or his assistants, shall find by inspection that any person, firm or corporation is maintaining a nuisance as described in this section, he shall notify in writing the owner or occupant of the premises containing the nuisance so disclosed of the fact that such nuisance exists. He shall include in such a notice a statement of the conditions constituting such nuisance, and order that the same be abated within a specified time, and a direction, written or printed, pointing out the methods which shall be taken to abate the same. Such notice and order may be served personally or by depositing the same in the postoffice properly stamped, addressed to the owner or occupant

of the land or premises upon which such nuisance exists, and the direction for treatments may consist of a printed circular, bulletin or report of the Inspector of Apiaries or an extract from same.

If the person so notified shall refuse or fail to abate said nuisance in the manner and in the time prescribed in said notice, the Inspector of Apiaries may cause such nuisance to be abated, and he shall certify to the owner or person in charge of the premises the cost of the abatement and if not paid to him within sixty days thereafter the same may be recovered, together with the costs of action, before any court in the State having competent jurisdiction.

In case notice and order served as aforesaid shall direct that any bees, hives, bee-fixtures or appurtenances shall be destroyed and the owner of such bees, hives, bee-fixtures or appurtenances shall consider himself aggrieved by said order, he shall have the privilege of appealing within three days of the receipt of the notice to the county court of the county in which such property is situated. The appeal shall be made in like manner as appeals are taken to the county court from judgments of justice of the peace. Written notice of said appeal served by mail upon the Inspector of Apiaries shall operate to stay all proceedings until the decision of the county court, which may, after investigating the matter, reverse, modify or affirm the order of the Inspector of Apiaries, who shall serve the same as hereinafter set forth and shall fix a time within which such decision must be carried out.

SEC. 2a. No person shall transport a colony of bees or used bee equipment, except a live queen and her attendant bees in a cage without comb or brood, from one county of this State to another county of this State, without a certificate from the Department of Agriculture, stating that it has, within sixty days before the date of shipment, inspected the colony or equipment and found it to be free from foulbrood.

SEC. 2b. No person shall transport a colony of bees or used bee equipment except a live queen and her attendant bees in a cage without comb or brood, into this State from a state or country having an inspector of apiaries or other officer charged with similar duties, without a certificate stating that the officer has, within sixty days before the date of shipment, inspected the colony or equipment and found it to be free from foulbrood.

No person shall transport a colony of bees or used bee equipment, except a live queen and her attendant bees in a cage without comb or brood, into this State from a state not having an inspector of apiaries or other officer charged with similar duties, unless the shipper or consignee has obtained from the Department of Agriculture, upon making a sufficient showing that the colony or equipment is free from foulbrood, a permit for the shipment into the State.

SEC. 3. The Inspector of Apiaries shall, on or before the second Monday in December of each calendar year, make a report to the Governor and also to the Illinois State Beekeepers' Association, stating the number of apiaries visited, the number of those diseased and treated, the number of colonies of bees destroyed and the expense incurred in the performance of his duties.

SEC. 4. Any owner of a diseased apiary or appliances taken therefrom, who shall sell, barter or give away any such apiary, appliance, queens or bees from such apiary, expose other bees to the danger of contracting such disease, or refuse to allow the Department of Agriculture to inspect such apiary or appliances, and any person who shall violate the provisions of Section 2a or Section 2b of this Act, shall be fined not more than $100.00.

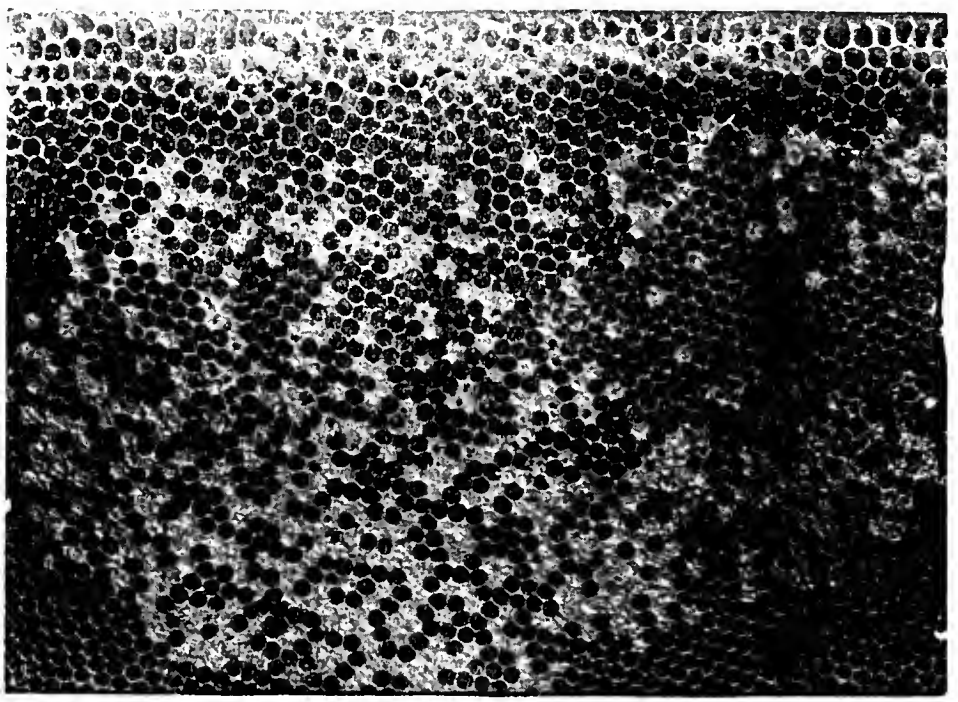
AMERICAN FOULBROOD

Description

(Bacillus larvae, White)

The best description which can be given is that of Dr. E. F. Phillips, in Farmers' Bulletin 442, of the Department of Agriculture.

"American foulbrood usually shows itself in the larva, just about the time that it fills the cell and after it has ceased feeding and has begun pupation (changing from the grub condition to the winged insect).



A Comb of American Foulbrood

At this time, it is sealed over in the comb (by the bees). The first indication of the infection is a slight brownish discoloration and the loss of the well-rounded appearance of the normal larva. At this stage the disease is not usually recognized by the beekeeper. The larva gradually sinks down in the cell and becomes darker in color and the posterior end lies against the bottom of the cell. By the time it has partially dried down and has become quite dark *(brown coffee colored)*, the most typical characteristic of this disease manifests itself. If a match, stick or toothpick is inserted into the decaying mass and withdrawn, the larva-remains adhere to it and are drawn out in a thread, which sometimes extends for an inch or more before breaking. This ropiness is the chief characteristic in diagnosing the disease. The larva continues to dry down and gradually loses its ropiness until it finally becomes merely a scale on the lower side wall and base of the cell. This scale adheres tightly to the cell and can be removed with difficulty from the cell wall.

The scales can be observed when the comb is held with the top inclined toward the observer, so that a bright light strikes the lower side wall. A very characteristic and penetrating odor is noticeable in the decaying larva. This can be best likened to the *odor of heated glue*.

"The majority of the larvae which die of this disease are attacked after being sealed in the cells. The cappings are often entirely removed by the bees, but when they are left they usually become sunken and frequently perforated. As the healthy brood emerges, the comb shows the scattered sunken cappings covering dead larvae, giving a characteristic appearance.

"Pupae (the transforming grub, also called chrysalis) also may die of this disease, in which case they, too, dry down, become ropy and have the odor and color. The tongue frequently adheres to the upper side wall and often remains there even after the pupa has dried down to a scale."

Treatment

Previous to treatment clip the queen's wings when everything has been provided, go to the diseased colony, remove the hive from its stand and put it about three or four feet back. Place a clean empty hive on the old stand with a flat board or flat cover half way over the empty hive body with a brick on it to keep the cover from falling off.

Now smoke the diseased colony just enough to keep them quiet and proceed to take out the frames and shake or brush off the bees in the open half of the empty body, putting the combs in another hive body that you have placed handy to receive them, keeping them covered.

After you have all the bees in the newly prepared hive, close the hive with the board that is already over half of it. Leave the colony two days, then at the end of this time raise the board that is used as a cover about six inches and bring it down on the hive with a quick slam. This will dislodge the bees that have clustered on the under side of the cover or board. Have a hive in close reach with frames and full sheets of foundation, quickly put this prepared hive over the one that has the bees in, the bees will go up in this hive and in the morning lift the top hive off and place it on the bottom board, if any bees are on the sides of the hive body brush them in front of the colony and your treatment is complete.

Now take the diseased combs and burn them. If any comb has been built on the board or cover, this also must be burned. If the inspector finds a colony that is too badly diseased to warrant treatment he may order same burned.

EUROPEAN FOULBROOD

Description

European foulbrood usually attacks the larva at an earlier stage of its development than American foulbrood and while it is still curled at the base of the cell. A small percentage of larvae die after capping, but sometimes quite young larvae are attacked. Sunken and perforated cappings may exist as in American foulbrood. The earliest indication of the disease is a slight yellow or gray discoloration and uneasy movement of the larva in the cell. It loses its well-rounded opaque appearance and becomes slightly translucent, so that the tracheae may become prominent giving the larva a clear segmented appearance. Later the color changes to a decided yellow or gray and the translucency is lost. The yellow color is the chief characteristic of this disease. The dead larva appears as a moist, somewhat collapsed mass, giving the appearance are being melted. The larva finally dries in a grayish-brown scale against the base of the cell, or a shapeless mass on the lower side wall. Very few scales are black. The scales are not adhesive, but easily removed, and the bees carry out a great many of them. Decaying larvae which have died of this disease are usually not ropy as in American foulbrood, but a slight ropiness is sometimes observed. Sometimes a sour odor is present, which reminds one of yeast fermentation.

Treatment

As soon as the disease shows, kill the old queen, and if the colony is common brown or black, keep all queen cells cut out. Fifteen days after you kill the queen, introduce a young laying Italian queen. If the colony be of good Italian stock, allow the colony to rear a queen. Keep the colony *strong*; a weak colony will not rid themselves of disease.

OLD BOX HIVES

Remove a portion of the top so you can blow smoke in, turn the hive upside down, and place a box as nearly the size of the old hive as you can get, on top. Smoke into the opening that you have made and drum on the box, until you have all the bees out of the old hive into the box on top.

Place the box containing the bees where the old hive formerly stood. Saturate the old hive and combs with kerosene and destroy as instructed in American foulbrood.

In two or three days dump the bees from the box into a hive body which is placed on the stand where the box was and fill the hive body with frames of foundation and place the cover on your hive. Destroy all combs that were built in the box.

If there is no disease in the old box hive, the bees may be run on full sheets of foundation at once.

SUGGESTIONS

By adhering to the following suggestions and avoiding the "Don'ts" the beekeeper may save himself much trouble and worry as well as financial loss.

Don't use frame hives without foundation.

Don't use box-hives, bees cannot be controlled in them.

Don't allow robbing in your apiary.

Don't waste your time trying to save a colony with only a handful of bees.

Don't buy everything you see advertised in bee papers, as they may not all fit your conditions.

Leave only a small entrance during spring, until your colonies show by clustering at entrance that a larger opening is necessary.

Keep all colonies strong, even should you have to resort to feeding in order to have the colony breed up. Feed granulated sugar syrup, a pound of sugar to a pound of water.

Use full sheets of foundation in your brood frames.

Keep a good strain of Italian bees.

Read the bee journals. The price of a good bee journal is money well spent.

If you winter your bees out of doors, give them adequate packing, using forest leaves or other absorbents for this purpose. Place at least six inches of leaves over the brood frames and at least four inches of leaves aound the hives, except the front, held in place by wire netting.

Black bees and low-grade hybrids are the most susceptible to European foulbrood. Keep only pure Italian bees.

Make an effort to produce more honey this vear than ever before.

FORMATION OF THE ILLINOIS STATE BEEKEEPERS' ASSOCIATION

SPRINGFIELD, ILL., *February 26, 1891.*

The Capitol Beekeepers' Association was called to order by President P. J. England.

Previous notice having been given that an effort would be made to form a State Association, and there being present beekeepers from different parts of the State, by motion, a recess was taken in order to form such an association.

P. J. England was chosen temporary chairman and C. E. Yocum temporary secretary. On motion, the Chair appointed Thos. G. Newman, C. P. Dadant and Hon. J. M. Hambaugh a Committee on Constitution.

Col. Charles F. Mills addressed the meeting on the needs of a State association and stated that it was his opinion that the beekeepers should have a liberal appropriation for a State Apiarian Exhibit at the World's Columbia Exposition.

A motion to adjourn 'till 1:30 p. m. prevailed.

AFTERNOON SESSION

The Committee on Constitution reported a form for same which, on motion, was read by the Secretary, by sections serially.

Geo. F. Robbins moved to substitute the word "shall" for "may" in the last clause of Section 1, article III. This led to a very animated discussion, and the motion was lost.

J. A. Stone moved to amend the above-named section by striking out the word "ladies" and all that followed of the same section, which motion led to further discussion, and motion finally prevailed.

Section 2, Article II, relating to a quorum, was on motion, entirely stricken out.

Mr. Robbins moved to amend Article V by adding the words "Thirty days' notice having been given to each member." Prevailed.

Thos. G. Newman moved to adopt the Constitution, so amended, as a whole. Which motion prevailed.

(See Constitution).

J. A. Stone moved that the Chair appoint a Nominating Committee of three on permanent organization. Prevailed.

Chair appointed as such committee, Col. Charles F. Mills, Hon. J. M. Hambaugh and C. P. Dadant.

Committee retired and in a few minutes returned, submitting the following named persons as candidates for their respective offices:

For President—P. J. England, Fancy Prairie.

For Vice-Presidents—Mrs. L. Harrison, Peoria; C. P. Dadant, Hamilton; W. T. F. Petty, Pittsfield; Hon. J. M. Hambaugh, Spring; Dr. C. C. Miller, Marengo.

Secretary—Jas. A. Stone, Bradfordton.

Treasurer—A. N. Draper, Upper Alton.

Mr. Black moved the adoption of the report of the Committee on Nominations. The motion prevailed, and the officers as named by the committee were declared elected for the ensuing year.

Hon. J. M. Hambaugh moved that Mr. Thos. G. Newman, Editor, American Bee Journal, of Chicago, be made the first honorary member of the association. Prevailed.

At this point, Col. Chas. F. Mills said:

"Mr. Chairman, I want to be the first one to pay my dollar for membership," at the same time suiting his action to his words, and others followed his example, as follows:

CHARTER MEMBERS

Col. Charles F. Mills, Springfield
Hon. J. M. Hambaugh, Spring
Hon. J. S. Lyman, Farmingdale
C. P. Dadant, Hamilton
Chas. Dadant, Hamilton
A. N. Draper, Upper Alton
S. N. Black, Clayton
Aaron Coppin, Wenona
Geo. F. Robbins, Mechanicsburg
J. W. Yocum, Williamsville
Thos. S. Wallace, Clayton
A. J. England, Fancy Prairie
P. J. England, Fancy Prairie
C. E. Yocum, Sherman
Jas. A. Stone, Bradfordton

FIRST HONORARY MEMBER

Thomas G. Newman, Editor American Bee Journal, Chicago.

STATE CHARTER

STATE OF ILLINOIS—DEPARTMENT OF STATE

Isaac N. Pearson, Secretary of State

To all to whom these presents shall come—GREETINGS:

Whereas, A certificate duly signed and acknowledged having been filed in the office of the Secretary of State on the 27th day of February, A. D. 1891, for the organization of the Illinois State Beekeepers' Association, under and in accordance with the provisions of "An Act Concerning Corporations," approved April 18, 1872, and in force July 1, 1872, and all acts amendatory thereof, a copy of which certificate is hereunto attached.

Now, Therefore, I, Isaac N. Pearson, Secretary of State of the State of Illinois, by virtue of the powers and duties vested in me by law, do hereby certify that the said, The Illinois State Beekeepers' Association, is a legally organized corporation under the laws of the State.

In Testimony Whereof, I hereunto set my hand and cause to be affixed the great seal of State.

Done at the city of Springfield, this 27th day of February, in the year of our Lord one thousand eight hundred and ninety-one, and the Independence of the United States the one hundred and fifteenth.

[SEAL] I. N. PEARSON, *Secretary of State.*

STATE OF ILLINOIS, }
County of Sangamon } ss.

To Isaac N. Pearson, Secretary of State:

We, the undersigned, Perry J. England, Jas. A. Stone, and Albert N. Draper, citizens of the United States, propose to form a corporation, under an act of the General Assembly of the State of Illinois, entitled, "An Act Concerning Corporations," approved April 18, 1872, and all acts amendatory thereof; and for the purpose of such organizations, we hereby state as follows to-wit:

1. The name of such corporation is, The Illinois State Beekeepers' Association.
2. The object for which it is formed is to promote the general interests of the pursuit of bee-culture.
3. The management of the aforesaid Association shall be vested in a board of three Directors, who are to be elected annually.
4. The following persons are hereby selected as the Directors, to control and manage said corporation for the first year of its corporate existence, viz: Perry J. England, Jas. A. Stone, and Albert N. Draper.
5. The location is in Springfield, in the county of Sangamon, State of Illinois.

(Signed) PERRY J. ENGLAND,
JAS. A. STONE,
ALBERT N. DRAPER.

STATE OF ILLINOIS, }
Sangamon County, } ss.

I, S. Mendenhall, a notary public in and for the county and State aforesaid, do hereby certify that on this 26th day of February, A. D. 1891, personally appeared before me, Perry J. England, James A. Stone, and Albert N. Draper, to me personnally known to be the same persons who executed the foregoing certificate, and severally acknowledged that they had executed the same for the purpose therein set forth.

In witness whereof, I have hereunto set my hand and seal the day and year above written.

[SEAL] S. MENDENHALL, *Notary Public.*

CONSTITUTION AND BY-LAWS OF THE ILLINOIS STATE BEEKEEPERS' ASSOCIATION

Constitution

ADOPTED FEB. 26, 1891

ARTICLE I.

This organization shall be known as The Illinois State Beekeepers' Association, and its principal place of business shall be at Springfield, Illinois.

ARTICLE II—OBJECT.

Its object shall be to promote the general interests of the pursuit of beeculture.

ARTICLE III—MEMBERSHIP.

SECTION 1. Any person interested in apiculture may become a member upon the payment to the Secretary of an annual fee of one dollar and fifty cents ($1.50). (Amended to $1.75, 1919; amended to $1.00 at annual meeting December 1928.) And any affiliating association, as a body may become members on payment of an aggregate fee of fifty cents (50c) per member, as amended November, 1910.

SEC. 2. Any person may become honorary member by receiving a majority vote at any regular meeting.

ARTICLE IV.—OFFICERS.

SECTION 1. The officers of this association shall be, President, Vice President, Secretary and Treasurer. (Since amended to include 5 regional Vice Presidents.) Their terms of office shall be for one year, or until their successors are elected and qualified.

SEC. 2. The President, Secretary and Treasurer shall constitute the Executive Committee.

SEC. 3. Vacancies in office—by death, resignation and otherwise—shall be filled by the Executive Committee until the next annual meeting.

ARTICLE V.—AMENDMENTS.

This Constitution shall be amended at any annual meeting by a two-thirds vote of all the members present—thirty days' notice having been given to each member of the association.

By-Laws

ARTICLE I.

The officers of the association shall be elected by ballot and by a majority vote.

ARTICLE II.

It shall be the duty of the President to call and preserve order at all meetings of this association; to call for all reports of officers and committees; to put to vote all motions regularly seconded; to count the vote at all elections, and declare the results; to decide upon all questions of order, and to deliver an address at each annual meeting.

ARTICLE III.

The Vice Presidents shall be numbered, respectively, First, Second, Third, Fourth, and Fifth, and it shall be the duty of one of them, in his respective order, to preside in the absence of the President.

ARTICLE IV

SECTION 1. It shall be the duty of the Secretary to report all proceedings of the association, and to record the same, when approved, in the Secretary's book; to conduct all correspondence of the association, and to file and preserve all papers belonging to the same; to receive the annual dues and pay them over to the Treasurer, taking his receipt for the same; to take and record the name and address of every member of the association; to cause the Constitution and By-Laws to be printed in appropriate form and in such quantities as may be directed by the Executive Committee from time to time, and see that each member is provided with a copy thereof; to make out and publish annually, as far as practicable, statistical table showing the number of colonies owned in the spring and fall, and the amount of honey and wax produced by each member, together with such other information as may be deemed important, or be directed by the Executive Committee; and to give notice of all meetings of the association in the leading papers of the State, and in the bee journals at least four weeks prior to the time of such meeting.

SEC. 2. The Secretary shall be allowed a reasonable compensation for his services, and to appoint an assistant Secretary if deemed necessary.

ARTICLE V

It shall be the duty of the Treasurer to take charge of all funds of the association, and to pay them out upon the order of the Executive Committee, taking a receipt for the same; and to render a report of all receipts and expenditures at each annual meeting.

ARTICLE VI

It shall be the duty of the Executive Committee to select subjects for discussion and appoint members to deliver addresses or read essays, and to transact all interim business.

ARTICLE VII.

The meeting of the association shall be, as far as practicable, governed by the following order of business:

Call to order.
Reading minutes of last meeting.
President's address.
Secretary's report.
Treasurer's report.
Reports of committees.
Unfinished business.
Reception of members and collection.
Miscellaneous business.
Election and installation of officers.
Discussion.
Adjournment.

ARTICLE VIII.

These By-Laws may be amended by a two-thirds vote of all the members present at any annual meeting.

C. E. YOCUM,
AARON COPPIN,
GEO. F. ROBBINS.

BEEKEEPERS' ASSOCIATION

The Original Bill

§ 1. Appropriates $1,000 per annum—proviso. § 2. How drawn. § 3. Annual Report.

AN ACT *making an appropriation for the Illinois State Beekeepers' Association.*

WHEREAS, The members of the Illinois State Beekeepers' Association have for years given much time and labor without compensation in the endeavor to promote the interests of the beekeepers of the State; and,

WHEREAS, The importance of the industry to the farmers and fruit-growers of the State warrants the expenditure of a reasonable sum for the holding of annual meetings, the publication of reports and papers containing practical information concerning beekeeping, therefore, to sustain the same and enable this organization to defray the expenses of annual meetings, publishing reports, suppressing foulbrood among bees in the State, and promote the industry in Illinois;

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* That there be and is hereby appropriated for the use of the Illinois State Beekeepers' Association the sum of one thousand dollars ($1,000) per annum for the year 1917-1918, for the purpose of advancing the growth and developing the interests of the beekeepers of Illinois, said sum to be expended under the direction of the Illinois State Beekeepers' Association for the purpose of paying the expenses of holding annual meetings, publishing the proceedings of said meetings, suppressing foulbrood among bees in Illinois, etc.

Provided, however, That no officer or officers of the Illinois State Beekeepers' Association shall be entitled to receive any moneys compensation whatever for any services rendered for the same, out of this fund.

SEC. 2. That on the order of the President, countersigned by the Secretary of the Illinois State Beekeepers' Association, and approved by the Governor, the Auditor of Public Accounts shall draw his warrant on the Treasurer of the State of Illinois in favor of the treasury of the Illinois State Beekeepers' Association for the sum herein appropriated.

SEC. 3. It shall be the duty of the Treasurer of the Illinois State Beekeepers' Association to pay out of said appropriation, on itemized and receipted vouchers, such sums as may be authorized by vote of said organization on the order of the President countersigned by the Secretary, and make annual report to the Governor of all such expenditures, as provided by law.

Itemized in the Omnibus Bill as follows:

For shorthand reporting	$ 200.00
For postage and stationery	50.00
For printing	550.00
Expense of meetings	200.00
Total amount of the appropriation	$1000.00

The Assembly ruled that this is not to be paid in LUMP, but drawn on itemized accounts.

CODE OF RULES AND STANDARDS FOR GRADING APIARIAN EXHIBITS AT FAIRS AS ADOPTED BY ILLINOIS STATE BEEKEEPERS' ASSOCIATION

Comb Honey

Rule 1. Comb honey shall be marked on a scale of 100, as follows:

Quantity	40	Style of display	20
Quality	40		

Rule 2. Points of quality should be:

Variety	5	Straightness of comb	5
Clearness of capping	10	Uniformity	5
Completeness of capping	5	Style of section	5
Completeness of filling	5		

Remarks: 1. By variety is meant different kinds, with regard to the sources from which the honey is gathered, which adds much interest to an exhibit.

2. By clearness of capping is meant freedom from travel stain and a water soaked appearance. This point is marked a little high, because it is a most important one. There is no better test of the quality of comb honey than the appearance of the cappings. If honey is taken off at the proper time, and cared for as it should be, so as to preserve its original clear color, body and flavor will take care of themselves, for excellence in the last two points always accompanies excellence in the first. Clover and basswood honey should be white; heartease, a dull white tinged with yellow; and Spanish needle, a bright yellow.

3. By uniformity is meant closeness of resemblance in the sections composing the exhibit.

4. By style is meant neatness of the sections, freedom from propolis, etc.

5. Honey so arranged as to show every section should score the highest in style of display, and everything that may add to the tastiness and attractiveness of an exhibit should be considered.

Extracted Honey

Rule 1. Extracted honey should be marked on a scale of 100, as follows:

Quantity	40	Style and display	15
Quality	45		

Rule 2. Points of quality should be:

Variety	10	Style of package	10
Clearness of color	5	Variety of package	5
Body	5	Finish	5
Flavor	5		

Remarks: 1. Light clover honey pouring out of a vessel is a very light straw color; Spanish needle, a golden hue, and dark clover honey, a dull amber.

2. Style of package is rated a little high, not only because in that consists the principal beauty of an exhibit of extracted honey, but also because it envolves the best package for marketing. We want to show honey in the best shape for the retail trade, and that, in this case, means the most attractive style for exhibition. Glass packages should be given the preference over tin; flint glass over green, and smaller vessels over larger, provided the latter run over one or two pounds.

3. By variety of package is meant chiefly different sizes; but small pails for retailing, and, in addition, cans or kegs (not too large) for whole-saling, may be considered. In the former case, pails painted in assorted colors, and lettered "Pure Honey," should be given the preference.

4. By finish is meant capping, labeling, etc.

5. Less depends upon the manner of arranging an exhibit of extracted than of comb honey, and for that reason, as well as to give a higher number of points to style of package, a smaller scale is allowed for style of display.

Samples of Comb and Extracted Honey

Rule 1. Single cases of comb honey, entered as such for separate premiums, should be judged by substantially the same rules as those given for a display of comb honey, and samples of extracted, by those governing displays of extracted honey.

Rule 2. Samples of comb or extracted honey, as above, may be considered as part of the general display in their respective departments.

Granulated Honey

Rule 1. Candied or granulated honey should be judged by the rules for extracted honey, except as below.

Rule 2. Points of quality should be:

Variety	10	Style of package	10
Fineness of grain	5	Variety of package	5
Color	5	Finish	5
Flavor	5		

Rule 3. An exhibit of granulated honey may be entered or considered as part of a display of extracted honey.

Nuclei of Bees

Rule. Bees in observation hives should be marked on a scale of 100, as follows:

Color and markings	30	Quietness	5
Size of bees	30	Style of comb	5
Brood	10	Style of hive	10
Queen	10		

Remarks: 1. Bees should be exhibited only in the form of single frame nuclei, in hives or cages with glass sides.

2. Italian bees should show three or more bands, ranging from leather color to golden or light yellow.

3. The markings of other races should be those claimed for those races in their purity.

4. A nucleus from which the queen is omitted should score zero on that point.

5. The largest quantity of brood in all stages or nearest to that should score the highest in that respect.

6. The straightest, smoothest and most complete comb with the most honey consistent with the most brood, should score the highest in that respect.

7. That hive which is neatest and best made and shows the bees, etc., to the best advantage should score the highest.

Queen Bees

Rule. Queen bees in cages should be marked on a scale of 100, as follows:

Quantity	40	Quality and variety	40
Style of caging and display	20		

Remarks: 1. The best in quality consistent with variety should score the highest. A preponderance of Italian queens should overweigh a preponderance of black ones, or, perhaps, of any other race or strain; but sample queens of any or all varieties should be duly considered. Under the head of quality should also be considered the attendant bees. There should be about a dozen with each queen.

2. Neatness and finish of cages should receive due consideration, but the principal points in style are to make and arrange the cages so as to show the inmates to the best advantage.

Beeswax

Rule. Beeswax should be marked on a scale of 100, as follows:

Quantity	40	Quality	40
Style of display	20		

Remarks: 1. Pale, clear, yellow specimens should score the highest, and the darker grades should come next in order.

2. By style is meant chiefly the forms in which the wax is molded and put up for exhibition. Thin cakes or small pieces are more desirable in the retail trade than larger ones. Some attention may be given to novelty and variety.

BEES AND HONEY PREMIUM WINNERS—1928 ILLINOIS STATE FAIR

Class J. Apiary—Amount Offered, $574.00

T. P. Smith, Danville.....Member in Charge
Dr. A. C. Baxter, Springfield.....Superintendent
E. W. Rittler, Quincy.....Judge

Case of white comb honey, 24 sections—8 entries, 7 shown.

1st, $4. Isabell Coppin, Wenona, Ill.; 2nd, $3. Elmer Kommer, Woodhull, Ill.; 3rd, $2. Edward S. Kobold, Peru, Ill. 4th, $1. Joseph H. Bearden, Taylorville, Ill.; 5th, Frank Bishop, Taylorville, Ill.

Case of amber comb honey, 24 sections—7 entries, 6 shown.

First, $4. Elmer Kommer; 2nd, $3. Frank Bishop; 3rd, $2. Isabell Coppin; 4th, $1. Edward S. Kobold; 5th, W. H. Snyder, Decatur, Ill.

Frame of comb honey for extracting—7 entries, 6 shown,

1st, $5. Frank Bishop; 2nd, $3. Isabell Coppin; 3rd, $2. Joseph H. Bearden; 4th, $1. Edward S. Kobold; 5th, Gypsy Queen Farm, Pawnee, Ill.

Collection of labeled cases white and amber honey, containing 12 or more sections—6 entries, 5 shown.

1st, $8. Frank Bishop; 2nd, $5. Elmer Kommer; 3rd, $3. Edward S. Kobold; 4th, $2. Isabell Coppin; 5th, $1. W. H. Snyder.

Display of comb honey—9 entries, 7 shown.

1st, $30. Isabell Coppin; 2nd, $25. Elmer Kommer; 3rd, $20. Frank Bishop; 4th, $15. Edward S. Kobold; 5th, $10. Joseph H. Bearden.

Display of light extracted honey, 40 to 60 pounds—9 entries, 7 shown.

1st, $8. Joseph H. Bearden; 2nd, $5. Isabel Coppin; 3rd, $3. Frank Bishop; 4th, $2. Elmer Kommer; 5th, $1. James A. Stone & Son, Farmingdale, Ill.

Display of Amber extracted honey, 40 to 60 pounds—8 entries, 6 shown.

1st, $8. Frank Bishop; 2nd, $5. Isabell Coppin; 3rd, $3. James A. Stone & Son; 4th, $2. W. H. Snyder; 5th, $1. Joseph H. Bearden.

Display of extracted honey—9 entries, 8 shown.

1st, $30. Frank Bishop; 2nd, $25. Joseph H. Bearden; 3rd, $20. Isabell Coppin; 4th, $15. Elmer Kommer; 5th, $10. James A. Stone & Son.

Display of Candied honey—7 entries, 6 shown.

1st, $30. Frank Bishop; 2nd, $25. Isabell Coppin; 3rd, $20. W. H. Snyder; 4th, $15. Edward S. Kobold; 5th, $10. James A. Stone & Son.

Display of designs in comb honey—5 entries, 4 shown.

1st, $20. Joseph H. Bearden; 2nd, $15. Frank Bishop; 3rd, $10. Isabell Coppin; 4th, $5. Edward S. Kobold.

One frame Observatory hive three banded Italian bees with queens—6 entries, 4 shown.

1st, $6. Joseph H. Bearden; 2nd, $4. W. H. Snyder; 3rd, $2. Frank Bishop; 4th, $1. Aaron Coppin, Wenona, Ill.

One frame Observatory hive, Golden Italian bees with queen—5 entries, 3 shown.

1st, $6. Elmer Kommer; 2nd, $4. Frank Bishop; 3rd, $2. Aaron Coppin.

Display of beeswax and designs in wax, not less than 50 pounds—9 entries, 8 shown.

1st, $30. Frank Bishop; 2nd, $25. W. H. Snyder; 3rd, $20. Joseph H. Bearden; 4th, $15. James A. Stone & Son; 5th, $10. Isabell Coppin.

Honey vinegar, one-half gallon, with recipe for making—5 entries, 3 shown.

1st, $4. Frank Bishop; 2nd, $3. Isabell Coppin; 3rd, $2. Edward S. Kobold.

Summary

On the basis of 5 points for a first place award, 4 points for second, 3 for third, 2 for fourth and 1 point for fifth, the exhibitors had the following ratings: Frank Bishop, Taylorville, 57; Isabelle and Aaron Coppin, Wenona, 48; Joseph H. Bearden, Taylorville, 29; Elmer Kommer, Woodhull, 26; Edward S. Kobold, Peru, 19; W. H. Snyder, Decatur, 15; James A. Stone & Son, Farmingdale, 8; Gypsy Queen Farm, Pawnee, 1.

GENERAL INFORMATION FOR BEEKEEPERS

Bee-Journals Published in the United States:

	Regular Subscription	To Assn. Members
American Bee Journal, Hamilton, Ill.	$1.00	50c
Beekeepers' Item, Box 838, San Antonio, Texas	1.00	75c
Beekeepers' Review, Almont, Mich.	.50	50c
Bees and Honey, 524 First Ave., S., Seattle, Wash	1.00	50c
Dixie Beekeeper, Waycross, Ga.	1.00	50c
Gleanings in Bee Culture, Medina, Ohio	1.00 (2 yrs.)	50c (1 yr.)

(The publishers will furnish sample copies upon request.)

Several trade and state associations publish journals or circulars of information for their memberhip as follows:

The American Honey Producer—Official organ of The American Honey Producers' League. (With membership at $1.50 per year, otherwise 75c per year.)

Wisconsin Beekeeping.

Monthly bulletin Illinois State Beekeepers' Association. (50c to non-members.)

Beecause. 12c. G. B. Lewis Co., Watertown, Wis.

Free Literature and Circulars on Bees and Honey.

Bureau of Entomology, U. S. Dept. of Agriculture.

Most state experiment stations have bulletins or mimeographed materials.

A. I. Root Co., Medina, Ohio—The Bee Hive.

Kellogg Co., Battle Creek, Michigan.

Recipe pamphlets: Do you like Honey? Cooking with Honey.

All-Bran poster, featuring a jar of honey.

Full page advertisement, featuring honey.

Manufacturers of Bee Supplies

The names of the leading bee supply manufacturers can be obtained by reading the advertisements in the bee journals. They will furnish catalogues upon request.

Shippers of Bees and Queens.

Consult the bee journals. The person or firm that remains in business over a period of years is usually the most reliable. When

in doubt as to the reliability of any particular advertiser, write to the editors for definite information.

Books on Bees and Beekeeping

	Price
Atkins and Hawkins—How to Succeed with Bees	$ .59
Campbell, C. P.—The Law of the Honey Bee	1.00
Dadant, C. P.—First Lessons in Beekeeping	1.00
The Dadant System of Beekeeping	1.00
New Observations Upon Bees—By Huber	3.00
Dadant, M. G.—Out Apiaries	1.00
Doolittle, G. M.—Scientific Queen Rearing	.50
Hawkins, K.—Beekeeping in the South	1.00
Langstroth & Dadant—The Honey-Bee	2.50
Lovell, J. H.—Honey Plants of North America	2.50
Miller, C. C.—Fifty Years Among the Bees	1.50
1,000 Answers to Beekeeping Questions	1.25
Pellet, F. C.—American Honey Plants	3.00
Productive Beekeeping	3.00
Practical Queen Rearing	1.00
Beginner's Bee Book	1.50
Phillips, E. F.—Beekeeping	4.00
Quinby, M.—Mysteries of Beekeeping Explained	1.00
Rowe, H. G.—Starting Right With Bees	.75
Smith, Jay—Queen Rearing Simplified	1.25
Snodgrass—Anatomy and Physiology of the Honey Bee	3.50
Root—A B C & X Y Z of Beekeeping	2.50

Any of this list of books can be purchased from the bee supply manufacturers or the beekeeping journals. Every beekeeper should read several of these books.

Advantages of Membership in State or County Beekeeping Associations.

1. Education on proper methods of managing bees which means bigger crops of quality honey marketed at quality prices.
2. United action and cooperation in the eradication of bee diseases.
3. Reduced rates on subscription to bee journals and free subscription to the association news.
4. Savings on bee supplies by ordering collectively.
5. Uniform prices for honey through cooperative marketing.
6. Acquaintance and friendship of brother beekeepers, developing a spirit of mutual helpfulness.

Diseases of Bees and Apiary Inspection

Illinois State Apiary Inspection—Mr. A. L. Kildow, Putnam, Illinois.

EXTRACT FROM CIRCULAR OF INFORMATION

Bee Culture Laboratories, Bureau of Entomology
United States Department of Agriculture
Washington, D. C.

Bulletins for Free Distribution

Farmer's Bulletin 447, Bees
Farmer's Bulletin 653, Honey and its Uses in the Home.
Farmer's Bulletin 961, Transferring Bees to Modern Hives. (5c?)
Farmer's Bulletin 975, Control of European Foulbrood.
Farmer's Bulletin 1012, Preparation of Bees for Outdoor Wintering.
Farmer's Bulletin 1014, Wintering Bees in Cellars.
Farmer's Bulletin 1039, Commercial Comb Honey Production.
Farmer's Bulletin 1084, Control of American Foulbrood. (5c?)
Farmer's Bulletin 1198, Swarm Control.
Farmer's Bulletin 1215, Beekeeping in the Clover Region.
Farmer's Bulletin 1216, Beekeeping in the Buckwheat Region.
Farmer's Bulletin 1222, Beekeeping in the Tulip-tree Region.
Department Circ. 24, United States Grades, Color Standards, and Packing Requirements for Honey. A chart showing requirements for grades of honey and a circular on labels or stamps for honey grades are included in this circular.
Department Circ. 218, Occurrence of Diseases of Adult Bees (?)
Department Circ. 222, Insulating Value of Commercial Double-Walled Hives. (?)
Department Circ. 284, The Sterilization of American Foulbrood Combs. (?)
Department Circ. 287, Occurrence of Diseases of Adult Bees, II. (?)

(Note:—The four preceding bulletins are available as long as the supply lasts.)

Department Circ. 334, The Bee Louse, Braula coeca, in the United States.
Department Bulletin 93, Temperature of Honeybee Cluster in Winter.
Farmer's Bulletin 1005, Sweet Clover on Corn Belt Farms.
Farmer's Bulletin 1062, Buckwheat.
Farmer's Bulletin 1151, Alsike Clover.
Farmer's Bulletin 1283, How to Grow Alfalfa.
Farmer's Bulletin 1411, Crimson Clover, Seed Production.

Bulletins For Sale by the Superintendent of Documents.

The following publications are not avaliable in the Department of Agriculture but may be purchased at the prices indicated. Remittances should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., by postal money order, express order or New York draft. If currency is sent, it will be at sender's risk. Postage stamps, defaced or worn coins, foreign coins and uncertified checks will not be accepted.

Department Bulletin 431, Sacbrood ..... 10 cents
Department Bulletin 685, Honeybees and Honey Production in the U. S. ..... 10 cents
Department Bulletin 780, Nosema Disease ..... 10 cents
Department Bulletin 804, A Study of the Behavior of European Foulbrood of Bees in the Colony ..... 5 cents
Department Bulletin 809, American Foulbrood ..... 15 cents
Department Bulletin 810, European Foulbrood ..... 10 cents
Department Bulletin 988, Heat Production of Honeybees in Winter ..... 5 cents
Department Bulletin 1222, Growth and Feeding of Honeybee Larvae ..... 10 cents
Department Bulletin 1328, Flight Activities of the Honeybee ..... 10 cents
Department Bulletin 1339, Effect of Weather upon the Change in Weight of a Colony of Bees during the Honeyflow ..... 10 cents
Department Bulletin 1349, Brood-Rearing Cycle of the Honeybee ..... 10 cents
Department Bulletin 1364, "Effects on Honeybees of Spraying Fruit Trees with Arsenicals" ..... 5 cents
Reprint K-128, Jr. Agriculture Research, Vol. XXVIII, No. 2, The Development of American Foulbrood in Relation to the Metabolism of its Causative Organism ..... 10 cents
Reprint K-141, Jr. Agric. Research, Vol. XXVIII, No. 12, Morphology of the Honeybee Larvae ..... 10 cents

"The Utilization of Carbohydrates as Food by Honeybee Larvae," by L. M. Bertholf and "The Utilization of Carbohydrates by Honeybees," by E. F. Phillips, are both published in No. 5, Vol. 35, Journal of Agricultural Research. This number sells for 20 cents.

Honey poster, "It's All Good Honey," may be purchased for 15 cents. The poster is printed in four colors and is designed to aid in selling honey.

Comb honey grading chart may be purchased for 15 cents. This chart is also printed in four colors.

Farmer's Bulletin 797, Sweet Clover: Growing the Crop.....(5c)
Farmer's Bulletin 820, Sweet Clover; Utilization.....(5c)
Farmer's Bulletin 836, Sweet Clover; Harvesting and Thrashing the Seed Crop.....(5c)

DISEASES OF BEES: Beekeepers in many parts of the country are suffering losses from the two serious brood diseases. Farmer's Bulletin 1084 gives the symptoms and treatment of American foulbrood and Farmers' Bulletin 975 gives similar information concerning European foulbrood. In case any discolored or dead brood is difficult to diagnose with accuracy, send a sample to the Bureau of Entomology for examination. On request the Bureau will mail a box suitable for the sending of a sample and give detailed directions for preparing it for mailing. Many states have apiary inspection for the detection of these diseases and for the instruction of the beekeepers in their control. Information concerning the inspection systems may be obtained from the Bureau of Entomology.

PURCHASE OF BEES: When a beekeeper desires to increase the number of his colonies by purchase, the most commendable plan is to buy up any colonies in the neighborhood which are in the hands of those who through their ignorance of good beekeeping practice are unable to get a crop. The purchase of bees in combless packages is advisable only where the shipper and the purchaser are both expert beekeepers. Do not send money for shipments of bees unless you are sure of the shipper's financial standing and business integrity.

The Department of Agriculture does not sell or distribute queenbees or colonies of bees of any race.

MARKETING: Where it is possible to develop a home market for the honey crop, this is recommended, but the beekeeper should be sure that he is not selling his crop so low as to lose the value of his labor. The Bureau of Agricultural Economics of the Department of Agriculture issues twice a month quotations giving the record of actual sales of honey on the leading markets of the country and these should be consulted before selling at wholesale. It also issues four reports annually on the crop conditions and the number and condition of the bees. These reports are free.

KEEP BEES BETTER

Cardinal Points:

(1) Bees need in spring—plenty of stores, plenty of room for brood rearing and plenty of protection.

(2) Swarming during a honey-flow is undesirable because it reduces the crop. See Farmers' Bulletin 1198 for methods of control.

(3) During a honey-flow bees should be given plenty of storage room. Neglect of this may lose half the crop.

(4) Bees need protection from cold and wind in all parts of the country in which the winter temperature is often as low as freezing. See Farmers' Bulletin 1012 for methods. In unusually cold and windy districts cellar wintering is advised and Farmers' Bulletin 1014 gives the best methods.

(5) The successful beekeeper is he who studies his bees and is prompt with his manipulations. Beekeeping is not a paying business for the shiftless beekeeper. The specialist beekeeper is the most desirable from the standpoint of the industry because the small holder usually has not sufficient interest in the bees to see that they do their best. There is no reason, however, why a few colonies of bees will not be profitable, provided the owner gives them intelligent care.

(6) It is impossible to keep bees with profit in box hives or "gums." The use of movable frame hives cannot be urged too strongly.

(7) It does not pay to cultivate any plant for bees but it may be possible in some localities to improve the nectar resources by the planting of plants such as sweet clover on waste lands. If at any time the bees are short of stores, feed sugar sirup, but avoid the use of any sugar other than granulated and do not use molasses or glucose. Do not let the bees starve or even get so short of stores that they decrease brood-rearing before the honey-flow.

James I. Hambleton,
Apiculturist.

MEMBERS OF ILLINOIS STATE BEEKEEPERS' ASSOCIATION

(Dues paid between October 1, 1927, and April 15, 1929)

Adams, Miss Edith, Earlville
Adam, G. M., 304 E. Euclid St., Arlington Heights
Adams, Clyde, R. R. 2, Bonnie
Aigley, Dr. J. E., 58 E. Fort St., Farmington
Allen, F. O., Stockland
Allgren, G. A., Bishop Hill
Ambrose, Lemual, White Heath
Ammon, Henry, Galena
Anderson, C. F., R. R. 10, Mt. Vernon
Anderson, C. J., R. R. 4, Box 102, Morris
Anderson, L. H., 525 Morgan St., Elgin
Annear, Roy, Mulkeytown
Applegate, J. F., 609 W. Beardsley Ave., Champaign
Archer, W. L., McLean
Attig, Fred, Ashton
Augenstine, A. A., R. R. 2, Dakota
Averill, Louis, 1417 June St., Kewanee
Backart, Arthur, Sadorus
Baker, Earl, Genoa
Baltimore, Guy, Woodhull
Bangs, E. H., 212 W. Washington St., Chicago
Barr, C. W., Gardner
Barr, H. I. & Son, Rock City
Barrett, Edw. E., 333 S. Waiola Ave., La Grange
Bartelt, Geo. A., R. R. 3, West Chicago
Barthoff, R. J., Richmond
Bassett, J. Harry, 613 East 5th St., Rock Falls
Batson, Amason, Aledo
Baxley, Roy, Christopher
Baxter, Dr. A. C., Myers Office Bldg., Springfield
Baxter, E. J., Nauvoo
Baymiller, Dr. Minnie M., Abingdon
Bean, Norval, R. R. 1, Eldorado
Bearden, Joe., 1014 Snodgrass St., Taylorville
Bell, Alvin, Ridgway
Bell, B. F., Box 56, Kingston Mines
Belt, Forest, Morrison
Belt, F. R., R. R. 5, Canton
Bennett, H. E., Townsend St., Sycamore
Bennett, James H., R. R. 3, Monticello
Benson, Mr. and Mrs. James D., 413 Spring St., Galena
Bent, J. M., Milledgeville
Benton, T. E., Johnson City
Berglund, William T., Geneseo
Berry, E. G., R. R. 4, Taylorville
Beyers, Henry C., 1520 N. Monroe, Decatur
Biegel, Wm., R. R. 3, Barrington
Biesicker, Hiram L., Monticello
Bima, Willie, R. R. 1, Johnston City
Binder, L. F., Harvard
Birch, Reed, R. R. 2, Lockport
Bishop, Frank, Taylorville
Boal, A. D., 94 Ross Court, Downers Grove
Boedeker, F. A., 334 W. 118th St., Chicago
Bodenschatz, J. Adam, Box 272, Lemont
Bolen, James, Dahlgren
Bourey, Fred, Rock City
Bowald, John, Secor
Bowen, C. E., Lyndon
Boyer, B. M., Jerseyville
Boyd, Senator Randolph, Galva
Bradley, Lon, Morrison
Braun, H. H., Williamsville
Brewer, Walter A., Atwood
Briggs, F. E., 211 N. Haddow Ave., Arlington Heights
Brigham, Wm. B., 1301 N. East St., Bloomington
Bright, John, R. R. 1, Normal
Broje, John, 2116 Neva Ave., Chicago
Brokaw, T. X. L., Nebo
Brown, Chas, Woodhull
Brown, Chas. W,. Aledo
Brown, Clen, Aledo
Brown, C. W., 118 E. Bond St., Monticello
Brown, Ed., Woodhull
Brown, E. W., Box 117, Willow Springs
Brown, Lynch, Scott Co., Monmouth

Brunner, Mrs. Myrtle M., R. R. 5, Decatur
Bryant, E. J., 710 Walnut Ave., Elgin
Bunker, D. H., La Fox
Burdzilduskas, Joe, Pana
Burgess, G. L., Bement
Burkart, C. C., Mendota
Burrows, Gene, 10330 Artesian Ave., Chicago
Burtis, John C., El Paso
Busch, Martin, 5011 Moody Ave., Jefferson Park
Bush, Frank, Jerseyville
Cable, Geo. S., El Paso
Calame, Tom, Witt
Caldwell, C. S., Elvaston
Caldwell, L. R., Mt. Vernon
Cale, G. H., c/o American Bee Journal, Hamilton
Campbell, Charles, 6147 S. Vickers Ave., Chicago
Campbell, E. J., 1208 Leland Ave., Springfield
Carlsen, Christ, R. R. 2, Gardner
Carlson, Chas., Woodhull
Carlson, P. A., Galva
Carmichael, Philip, Stanford
Carner, Jay, Woodhull
Carpenter, Michael, Cortland
Carson, S. W., Harvard
Cass, B. C., Box 552, Chenoa
Casson, Fred, R. R. 1, Farmington
Chamberlin, Marc, 304 No. Calif., Sycamore
Chamberlin, Porter, S. 4th St., De Kalb
Chambers, J. O., Pierson
Chamness, Elias A., Carterville
Chandler, Chester, R. R. 1, Alexis
Chandler, Paul, Aledo
Chapman, Mrs. S. H., 307 Calumet Ave., Aurora
Chesterman, P. L., Tower Hill
Clark, Frank, Ridott
Clark, Geo., 237 West Empire, Freeport
Clausson, S. S., Oregon
Cleveland, Frank, Prophetstown
Clifford, Irl, Altona
Clower, H. L., Morrisonville
Cluck, N. A., McConnel
Collins, Thos., Wellington
Concidine, Frank, 515 DeKalb Ave., DeKalb
Concidine, Roy, 519 DeKalb Ave., DeKalb
Confer, Edgar, Lindenwood
Conner, John, R. R. 2, Caldwell, N. J.
Coon, Edson, Galva
Copenheaver, W. E., Mansfield
Coppin, Aaron, Wenona
Cornelius, W. H., Dow
Courtney, R. H., R. R. 7, Canton
Cox, Bernard, Woodhull
Cox, James H., R. R. 1, Hudson
Creet, C. H., Reynolds
Cronk, H. M., 6620 S. Hoyne Ave., Chicago
Crow, W. E., Gibson City
Crum, F. O., Palmyra
Curphy, John, Onarga
Cushman, Samuel, Room 506, 6 E. Lake St., Chicago
Cyka, Joseph F., 252 Illinois Ave., Elgin
Dadant, C. P., Hamilton
Dadant, H. C., Hamilton
Dadant, L. C., Hamilton
Dadant, M. G., Hamilton
Danner, U. K., R. R. 2, Mt. Vernon
Dauhmer, H. J., R. R., Marion
Davis, Ward O., R. R. 3, Eldorado
Davy, Ernest H., Morris
Day, Alva, Lovington
Dean, D. H., Congerville
Dean, L. A., R. R. 1, Big Rock
Decker, H. U., Aledo
Denning, James E., Joy
DeSort, Frank, 1308 Ottawa St., Lincoln
Devillez, Fred, Harrisburg
Diedrich, Mr., DeKalb Ave., DeKalb
Diercouff, J. W., Ridgeville
Dineen, J., St. Nicholas Hotel, Springfield
Dodge, Aldon A., 508 W. Grant St., Streator
Doermann, A. W., 135 Grove St., Blue Island
Donaldson, J. S., Hamilton
Dowell, Fred, West McHenry
Downs, W. A., Box 162, Easton
Draper, C. R., West McHenry
Dressel, F. L., Jerseyville
Duax, C. L., 3414 S. Western Ave., Chicago
Duckwall, W. G., R. R. 2, Jacksonville
Duerrstein, C. W., R. R. 1, Galena
Dulleck, Frank, Spring Grove
Duncan, A. L., R. R. 1, Alexis
Dunlap, Geo., Bondville
Dunn, H. L., Onarga
Eckhardt, G. H., 330 W. Roosevelt St., DeKalb
Egbert, W. C., Aledo
Eicher, Frank, R. R. 4, Batavia
Eisenbise, Ira B., Lanark
Eldred, M. G., R. R. 1, Bartlett

Engel, John H., Danvers
Engelkes, John, Rochelle
Erb, Geo., Jerseyville
Ermerling, Geo. J., R. R. 2, Kilbourne
Evans, J. H., R. R. 1, Dewey
Faist, John, R. R. 1, Freeport
Farrar, E. O., Abiline, Kansas
Fehr, Bennie, R. R. 1, Roanoke
Felderman, C. L., Galena
Ferlin, Rev. John K., Lemont
Fessler, A. B., Cambridge
Finch, W. I., New Boston
Fink, Geo., Washington
Fischer, Benj. H., Roanoke
Flake, Fred, R. R. 2, Aledo
Flax, Charles, 87th & Paulina Sts., Chicago
Folk, Frank A., R. R. 4, Polo
Force, W. H., 1714 W. Church St., Champaign
Foster, Geo., Box 92, Cuba
Fowler, Delos, Hillsdale
Fowler, J. H., R. R. 1, Ewing
Franks, Glenn, Erie
Frederick, Brother, Techny
Freres, H. N., 1110 N. Vanborn St., Marion
Freymeyer, H. G., Carbon Cliff
Funk, Henry W., 710 N. School St., Normal
Funkhouser, Ora, 724 Big 4 St., Eldorado
Gage, John A., Texico
Garret, E. E., Monticello
Gasnow, John L., 1020 12th Ave., Moline
Gates, C. M., Tiskilwa
Gerson, Louis, R. R. 2, Godfrey
Getz, Joe, Metamora
Gill, A. G., 224-226 W. Huron St., Chicago
Gillett, Geo. B., Hanna City
Glass, Glenn, Cameron
Glossen, Math., West McHenry
Goetz, Erich, R. R. 1, LaMoille
Goodsell, Gilbert, R. R. 2, Cameron
Gosteli, J. J., Strawn
Graffam, Frank, 433 Haish Ave., DeKalb
Graham, Harry, Pierson
Grasser, John, Jr., West McHenry
Greeling, Jacob, Godfrey
Greer, R. M., Joy
Greet, Charles, Reynolds
Groh, Edw., 3971 Normandy Ave., Chicago
Gundry, Joseph, Warren
Guthrie, Melville M., 4845 N. Meade Ave., Chicago
Haan, J. Frank, Des Plaines
Haas, Peter, El Paso
Hageman, R. J., 224 Moseley St., Elgin
Haggerty, Ada, Palos Park
Hajorth, T. J., R. R. 1, Fenton
Halla, G. T., 5220 Winthrop Ave., Chicago
Hamilton, Ivan, R. R. 2, Aledo
Hammond, Allie, Prophetstown
Hanke, Paul, R. R. 3, Palatine
Hardesty, Mrs. Wm. T. O., 100 S. 10th St., Oregon
Harding, Geo. P., Monticello
Harlow, W. H., Texico
Harrington, Miss H. D., 809 Spencer Ave., Peoria
Harris, G. F., R. R. 3, Canton
Harris, Geo. T., R. R. 2, Taylor Ridge
Harris, W. W., Box 565, Malta
Hart, Hans, 10251 Ave. M., Chicago
Hart, W. H., Harrisburg
Hartke, Benj., Buckley
Hartman, George & Son, R. R. 3, Freeport
Hartman, Magnus, Eureka
Hartz, Herman, R. R. 2, Palatine
Haslan, John, Jr., Howeaqua
Hassig, Elmer, 311 Iowa St., Joliet
Hatch, Harry R., Lisle
Hawkes, Wilbur D., E. Wilson St., Batavia
Hayes, Thos. J., R. R. 2, Taylor Ridge
Heffner, Edward, R. R. 5, Canton
Heise Bros., Palatine
Heitman, H., Hamilton
Heldt, Carl L., 801 West Jefferson St., Bloomington
Heldt, Edw. C., Stanford
Henrichs, John, Sr., Thornton
Henricks, J. T., R. R. 1, Chatsworth
Herrick, Mrs. Grace, c/o T. B. Sanitarium, Oak Forest
Hervey, W. A., 907 Knoxville, Peoria
Hibbard, C. L., Midlothian
Higgins, Mrs. James, R. R. 2, Lewistown, Montana
Highfill, Edward, Grafton
Hill, A. P., 15939 Carse Ave., Harvey
Hill, C. E., R. R. 3, Windsor
Hill, Geo. H., 425 Crittenden St., Hillsboro
Hoefer, A. G., 1655 Walnut Ave., S., Freeport

Hoes, T. Scott, Butler
Hofer, F. C., R. R. 2, Taylor Ridge
Hofmann, Frank, Riverside
Hohertz, W. A., La Moille
Holm, Chris, Box 381, Genoa
Holmes, T. J., Belle Rive
Holstlaw, T. J., R. R. 6, Mt. Vernon
Hoover, Dan, R. R. 1, Monmouth
Horning, Lee, R. R. 4, Morrison
Howarth, Anton, 2917 Natchez, Chicago
Housh, G. Y., Galesburg
Howlett, Jess, Aledo
Hudelson, Clyde W., Normal
Huffman, Alva, Woodhull
Huessner, Valentine, R. R. 3, Box 10, Lemont
Hunt, C. D., New Bedford
Hurff, Harry L., Easton Rd., Peoria
Hurley, Tim, Richmond
Isringhausen, C. J., Jerseyville
Jackson, Francis, Dewey
Jackson, S. D., Bartlett
Jacobs, F., Mt. Morris
Jacobs, Raymond, R. R. 2, Box 84, Chenoa
Jeffrey, Edward, Galena
Jepson, C. J., Ringwood
Johnson, Carl A., 417 S. Vine St., Kewanee
Johnson, Frank O., R. R. 1, Box 115, Cambridge
Johnson, Henry, Prophetstown
Johnson, Joe, R. R. 2, Maple Park
Johnson, John F., R. R., Box 99, East Moline
Johnson, Mrs. Mary F., 418 S. Adams St., Peoria
Johnson, Pardon, Taylor Ridge
Johnson, R. I., R. R. 5, Urbana
Jones, G. H., 38 S. Dearborn St., Chicago
Jones, Leroy, 307 "The Wildom," Hoopeston
Jones, H. W., Cary
Kairis, Mike, 106 W. 7th, West Frankfort
Kaneville Grain & Supply Co., Kaneville
Kaufman, Henry, Stanford
Keister, Milton, R. R. 7, S. Main Road, Rockford
Keith, Virgil R., Franklin Grove
Keller, P. E., 2105 W. Cedar Road, Homewood
Kelley, A. A., Gilman
Kelley, B. J., Gilman
Kelley, Chas. F., Brimfield
Kelley, John, Henning
Kelley, Otis, R. R. 5, Marion
Kellogg, Jas. B., Lombard
Kemmis, Edward, Prophetstown
Kempf, Dennis, Roanoke
Kenan, John W., R. R. 5, Galesburg
Kennel, Geo. W., Metamora
Kennett, O. W., Ohlman
Kerwin, Mrs. Hope E., Gross Point
Kettering, Frederick, Monmouth
Ketterman, A. R., Little York
Kidd, Jessie L., R. R. 1, Champaign
Kiefer, Windel, R. R. 2, Belle Rive
Kiefer, Xavier, Belle Rive
Kildow, A. L., Putnam
Kirch, Michael, 4534 Harvey Ave., Western Springs
Kirk, Wm. S., Farmersville
Kirlin, Elva, Warsaw
Kling, Charles, 5719 N. Hermitage Ave., Chicago
Klump, Orville F., Strasburg
Knantz, Chas., Galena
Knearem, Oscar, Shelbyville
Kness, John, Morrison
Kobold, Edw. S., 1727 9th St., Peru
Koehler, Edwin, Itasca
Kommer, Ed., R. R. 4, Cambridge
Kommer, Elmer, Woodhull
Koon, Wm. T., Onarga
Koontz, Frank, Stewardson
Koritz, J. N., R. R. 3, Buckley
Korloski, Albert, R. R. 8, Decatur
Kraemer, Wm., 6331 Cornelia Ave., Chicago
Kress, J. F., Morrison
Krier, Anna, Des Plaines
Krueger, Gust, Geneseo
Krynicki, Mrs. M., 3757 N. Richmond St., Chicago
Kubiak, Frank, 4910 W. 30th Place, Cicero
Kull, James F., Strasburg
Kyle, D. Ralph, R. R. 5, Monmouth
Lackie, Lester, Bradford
Lake, E. S., 920 Pekin St., Lincoln
Lalor, Frank, Valley View Farm, Barrington
Lamkin, H. J., R. R. 4, Harrisburg
Lancaster, Wm., Prophetstown
Landen, Erie, R. R. 1, Melrose Park
Larson, A. E., Bement
Larson, M., Gardner
Lawrence, W. G., R. R. 1, Fulton
Lechler, E. F., 210 Fifth Ave., Wilmette
Lee, Robert, R. R. 1, East Moline
Lefler, F. M., Hamilton
Lehman, Ed., R. R. 8, Peoria
Leibert, Ralph M., Elizabeth

Lester, Bert, Ashkum
Lewis, Dr. T. B., Hammond
Lind, M. H., Bader
Lingenfelter, Wayne, Ullin
Lossee, Richard, Sandwich
Love, Lloyd, Orion
Lund, Elias, 6418 N. Nashville Ave., Norwood Park
Lundahl, A. L., Geneseo
Lyman, Mrs. Walter C., 900 Ogden Road, Downers Grove
Lynn, George, 5th & Madison Sts., Lockport
Lynn, Robert, 5th & Madison Sts., Lockport
Lyon, Ralph E., Denver
Machcek, Jacob, Riverside
Mackelden, C. A., Jerseyville
Madsen, L., Gardner
Magers, H. C., 120 S. Kenilworth Ave., Elmhurst
Magnuson, Eskil, Galva
Mahaffey, Roland J., Cambridge
Mangold, Frank, Mansfield
Mapes, Maxel, Paris
Marek, Ed. V. M., R. R. 8, Peoria
Margibeth, Edward, 213 20th St., East Moline
Marsh, Mrs. W. V., Aledo
Marshall, Wm., 1015 Pleasant St., DeKalb
Marxmann, H. F., Shelbyville
Matthew, O. R., Virginia
May, Fred H., Meredosia
Mayewski, L. F., Byron
McCaffuey, W. H., 704 E. Stephenson St., Freeport
McClure, J. H., Roodhouse
McCormick, E. J., 6810 S. Winchester Ave., Chicago
McDaniels, J. E., Girard
McElhose, A. L., 816 Belmont Ave., N., Arlington Heights
McGonigle, D. C., Tampico
McInnes, Ralph, Sidney
McKenrick, J. W., Silvis
McKenrich, Ray, Silvis
McKillop, Dan, Lynn Center
McMillan, Granville, 348 W. Locust, Canton
McNair, F. J., Dahlgren
McPherson, Onis, R. R. 3, Mt. Vernon
McRoberts, Mathew, Chemung
Medford, George, Jerseyville
Meineke, E., Arlington Heights
Meinen, F. & Son, Baileyville
Meister, L. B., Metamora
Meister, W. J., Low Point
Meredith, M. E., 631 Congress St., Elgin
Merifield, Paul, Council Hill
Merrett, Johnny, Carthage
Metzner, John, Hooppole
Meyer, Ernst, Columbia
Meyer, Dr. R. C., Hillsdale
Meyers, Arthur, Baileyville
Middleton, O. E., Assumption
Miller, A. C., Waddams Grove
Miller, Frank, Galena
Miller, F. G., 233 S. Vine St., Kewanee
Miller, F. W., 1112 Oak Ave., Evanston
Miller, George, Waddams Grove
Miller, H. E., Aledo
Miller, Lew, Alexis
Miller, Ralph S., Dwight
Miller, Roy S., Little York
Miller, Wm. T., Danvers
Milliken, Emery, McConnell
Milum, V. G., Vivarium Bldg., Champaign
Miner, A. B., Table Grove
Mitton, Major L., 2737 S. 58th Court, Cicero
Moler, Mike, R. R., Box 75, East Moline
Mon, Chas., Polo
Monroe, Thos., R. R. 8, Peoria
Moon, Miss Gladys, 505 Machin Ave., Peoria
Moon, S. B., 505 Machin Ave., Peoria
Moore, Geo. W., 822 24th St., Cairo
Morgan, Glen, Aledo
Morgan, H. R., Aledo
Morrill, Ross R., R. R. 2, Batavia
Mosher, Albert, Port Byron
Motsinger, Sam, R. R. 1, Pittsburge
Moye, Kelley E., Omaha
Moye, Otto, R. R. 2, Omaha
Mozee, Gun, 1017 Dakin St., Chicago
Muehleip, Herman, Warren
Mueller, Max E., 814 Park Ave., Wilmette
Mueller, W. G., Bluffs
Munroe, J. W., Plainfield
Myers, Arthur, Baileyville
Myers, W. L., Geneseo
Nagel, W. J., Sheldon
Nance, H. H., Windsor
Neisler, Harold E., Irving
Neisman, F. W., R. R. 3, Winslow
Nelson, C. F., Hillsdale
Newcomb, William, Carmi
Newman, Chas. Clearing Station
Nice, Jacob, Dahlgren

Noack, Max, 744 S. Crawford Ave., Chicago
Norris, Chas., Monticello
Nussell, Chas. R., Villa Grove
O'Brien, John, Newark
Oeth, Carl F., Johnson City
Oleson, Christ, Hinckley
Olson, David, R. R. 7, Monmouth
Olson, Gus, 740 43rd St., Moline
Osborn, Wesley W., Hillsboro
Osburn, William, Morris
Ott, Raymond, Geneseo
Ottaway, Ella M., 9601 Robey St., Chicago
Overstreet, Nathan, Woodhull
Page, Ray, McHenry
Page, W. E., Ina
Pallister, Ralph, 210 W. College St., Harrisburg
Parkman, Hiram, Aledo
Parrott, J. H., 521 Brown St., Litchfield
Peach, Robert J., Mitchell & Olive Sts., Arlington Heights
Peckman, George, R. R. 3, Aledo
Pellett, Frank C., Hamilton
Pennington, H. W., 1106 N. Vanborn St., Marion
Peoria Seed & Bird Store, 406 S. Adams St., Peoria
Peterson, C. B., 11335 S. Western Ave., Chicago
Peterson, Edwin, 1325 Pine St., Kewanee
Peterson, Lawrence, 1325 Pine St., Kewanee
Peterson, S. F., 2326 Third Ave., East Moline
Piatt, Scott, Monticello
Pinnow, Louis, Jr., N. Crystal Lake
Piper, C. A., R. R. 3, Woodlawn
Pittman, J. C., Roseville
Pitzen, M. J., McHenry
Polcyn, A. J., 1323 Clement St., Joliet
Potter, Ben, Mt. Pulaski
Powers, Austin, Sterling
Pratapas, D. B., 6953 S. Western Ave., Chicago
Prescott, Louis, Milan
Price, Henry, Elizabeth
Quinley, A. J. L., Cameron
Rambolt, Louis L., 616 Belden Ave., Chicago
Rapp, Isadore, Belle Rive
Rasmussen, George, 1203 W. Stoughton, Urbana
Read, Arthur, Eldorado
Reents, L. H., 410 S. Montgomery St., Litchfield
Reese, Henry C., Mount Prospect
Retzer, Allie, Hamburg
Reulecke, William, Assumption
Rice, Art. V., 82 Cedar St., Farmington
Rice, D. A., 82 Cedar St., Farmington
Rice, Mike, 170 Cleveland Ave., Batavia
Rice, Wm., 82 Cedar St., Farmington
Richards, J. D., Scalesmound
Riehl, Miss Amelia, Godfrey
Rife, C. F., Naperville
Ripley, Don, R. R. 2, Illinois City
Ritter, W. L., Genoa
Rittler, E. W., 2307 Elm St., Quincy
Robinson, E. W., Jr., 1354 23rd Ave., Rock Island
Rocke, Lawrence, Roanoke
Rocke, Virgil E., Eureka
Rodermaker, H. C., Morrison
Rodgers, H. D., Box 773 Lewistown
Rogers, Frank, Wyoming
Root, A. I. Co., 224-226 W. Huron St., Chicago
Rose, Herbert, Windsor
Roselieb, Roy, Prophetstown
Roselieb, A. C., Morrison
Ross, Ezra, Morris
Rudd, Samuel J., 129 N. Van Buren St., Batavia
Rue Seed Co., Inc., The, 418 S. Adams St., Peoria
Sager, C. F., 321 S. 8th St., Chillicothe
Saucilus, F., 304 E. 6th St., West Frankfort
Sauer, Geo. L., Polo
Sauermann, Otto, 954 W. 103rd Place, Chicago
Sauter, G. W., R. R., Malta
Scharfenberg, Wm., Morrison
Scheid, J. P., Eureka
Schmertman, Louis, 1326 S. Oak Ave., Freeport
Schmitz, F. A., Hanson
Schmoll, C. F., Osco
Schofield, Dr. J. A., El Paso
Schrafer, G. W., Box 237, Eldorado
Schuett, Chas. J,. 1027 Sherman Ave., Evanston
Schumacher, H. W., Eureka
Schwark, John, R. R. 5, Sterling
Schwartz, Dr. J. G., Jerseyville
Schwingel, J., Wheeling
Schwinn, George, Orangeville
Scott, J. Emmett, R. R., Carthage
Scott, Roy, R. R. 2, Rock Falls
Scott, W., 1401 Austin Blvd., Cicero

Seifert, Ira H., 5622 S. Throop St., Chicago
Sering, Mrs. B., 3541 Natchez Ave., Chicago
Shafer, J. J., Rock Grove
Shaw, Floyd, Prophetstown
Shay, Geo., Bement
Shepherd, T. J., Opdyke
Shields, Lester, Stanford
Shipp, R. W., 224 S. 7th St., DeKalb
Shoff, Myron B., R. R. 1, Peoria
Simmer, Mrs. E. N., 9607 Beverly Ave., Chicago
Sincock, W. E., Scales Mound
Sittler, Ida, Hooppole
Skaggs, Dr. A. A., Lovington
Slankard, J. O., R. R. 4, Harrisburg
Slater, C. W. (Pete), Pana
Sloman, Geo. I., R. R. 3, Pawnee
Small, Dee, Marion
Smidth, Mathias, 105 Summit St., Joliet
Smith, A. W., R. R. 2, Aledo
Smith, Chas., Box 17, Shabbonna
Smith, E. T., W. Cleveland St., Freeport
Smith, Geo., 420 Hillside Ave., Hillsboro
Smith, J. G., Douglass Ave., Flossmoor
Smith, John F., Eureka
Smith, L. H., R. R. 1, Eldorado
Smith, Paul, Lovington
Smith, Wallace, Cameron
Smith, W. B., R. R. 1, Eldorado
Snell, David H., Washington
Snow, C. H., Reynold
Snow, W. E., Geneseo
Snyder, John W., R. R. 3, Freeport
Snyder, Wilbur W., N. Albert Ave., Freeport
Spaulding, Lewis G., R. R. 2, Springfield
Stanish, E. C., Marengo
Stanley, E. H., Dixon
Stanley, Ulysses G., Mountain View Apiary, Nisbet, Pa.
Stanton, Edwin M., 275 N. View St., Aurora
Sterns, R. W., 314 N. Calif. St., Sycamore
Steiner, James, Geneseo
Steinle, Raymond, Galena
Stendel, Wm., 11115 Edbrooke Ave., Chicago
Stevens, C. W., Aledo
Stevens, R. E., Tower Hill
Stevenson, A. M., 3021 Jarvis Ave., Chicago
Stewart, Miss Frances, Aledo
Stewart, Henry, Prophetstown
Stocker, Frank G., 1174 Maple Ave., Oak Park
Stone, Jas. A., Farmingdale
Strieder, C. G., Brimfield
Stroberg, Fritz, Sycamore
Stuckey, Lee, Martinton
Stumm, W. H., R. R. 3, Edinburg
Swanson, A. E., Hooppole
Swanson, C., Hamilton
Swezey, A. H., 19 N. Kensington Ave., Lyons
Swezey, Mrs. J. W., Garden Prairie
Sykora, Albert, Box 747, Silvis
Taylor, Lewis, Bement
Taylor, O. W., Griggsville
Terpening, John, R. R. 6, Galesburg
Thomas, Alfred E., Secor
Thomas, Curtis, Moweaqua
Thomas, E. A., West McHenry
Thomas, O. G., R. R. 4, Harrisburg
Thompson, H. C., 2614 17th Ave., Moline
Thompson, Roy, Sycamore
Tienstra, Ralph, Homewood
Tilley, W. A., Tower Hill
Tippler, Wm., R. R. 3, El Paso
Toth, John S., 3326 Kimball Ave., Chicago
Travis, S. W., 804 Locust St., Litchfield
Trent, A. L., 397 Herrick Road, Riverside
Tudor, C. H., 137 Evans Ave., DeKalb
Ulmer, G. B., Strasburg
Unruh, Martin, Barington Ave., Dundee
Utt, Archie V., Oak Lawn
Utterback, H. E., R. R. 2, Ridgefarm
Vail, Joe, Lewiston
Valerius, Chas, Elkville
Van Butsele, Louis, 720 N. Center St., Collinsville
Van Dyke, Ben, Morrison
Vannis, Louie, Harrisburg
Van Osdol, F. A., Morrison
Van Tine, W., R. R. 6, Box 9, Monmouth
Vaughan, S. G., Roseville
Voight, William H., Monee
Voss, Karl & Son, R. R. 6, Freeport
Voss, Wm. H., Victoria St., Barrington

Wachter, Martin, R. R. 3, Box 22, Hinsdale
Wager, Clarence, Genoa
Wagner, J. N., 638 E. Stephenson St., Freeport
Walenga, A., 15307 Ashland Ave., Harvey
Wales, A., 810 Glidden Ave., DeKalb
Walker, A. J., R. R. 1, Decatur
Wallanchas, Wm., 5715 Dunham Rd., Box 166, Downers Grove
Walter, John D., R. R. 1, Box 56, Congerville
Walton, James, Galena
Wangler, Henry, Belle Rive
Warehime, James, R. R. 3, Monticello
Warner, Emory, Monticello
Warren, Harry R., 526 W. 18th St., Chicago
Waterman, F. C., Bartlett
Watson, Frank, Jerseyville
Watt, George R., Hamilton
Watts, Searel, Monticello
Weaver, Walter, R. R. 1, Cameron
Webber, A. E., Mineral
Weddle, C. M., Cisco
Weiland, H. E., Assumption
Weiss, Lawrence M., R. R. 1, Taylor Ridge
Wellbrock, Claus, R. R. 4, Peoria
Wellner, Ned, 109 Walsh St., Joliet
Werner, Fred, 416 McCormick Ave., Hollywood
West, A. N., Aledo
Weston, N. A., W. Springfield Ave., Champaign
Wheeler, Vernon, Mazon
White, Victor H., Onarga
Wicena, Dr. A. M., 2838 W. Polk St., Chicago
Wiersema, Klaus, Fulton
Wilde, Clyde, Oregon
Wiley, C. H., Box 210, Harrisburg
Wilhelms, John, Forreston
Wilkenson, Ida, R. R. 2, Harvard
Williams, A. W., Cora
Williams, R. J., Danvers
Williams, W. H., P. O. Box 472, Pekin
Wills, E. B., Wheaton
Wilson, Howard H., Geneseo
Wilson, H. W., 38 Bee St., Eldorado
Winkler, Mrs. Edw. R. R. 1, Joliet
Wirth, Edward Lee, R. R. 2, Prophetstown
Wise, L. W., Watseka
Wolcansek, Joe, Witt
Wolcott, J. L., Emeline & Major Sts., Normal
Wooldridge, R. E., 2021 W. 71st St., Chicago
Wood, Ray, Taylor Ridge
Wooden, Roy, R. R. 2, Mt. Vernon
Woody, A. L., 19 South Wells St., Chicago
Wookey, Alonzo, R. R. 4, Peoria
Wooldridge, J. R., 2021 W. 70th St., Chicago
Word, G. L., Gibson City
Wright, Lester D., Fenton
Wrigley, S. W., 123 W. Walnut St., Sycamore
Wuetig, Christian J., 118 Vermont St., Blue Island
Wyman, Ray, 712 East Orin St., Freeport
Wyne, E. C., Lintner
Yakey, S. H., Mode
Young, C. F., 414 S. Hamilton Ave., Monticello
Young, Scott, Monticello
Young, W. C., 8514 S. Elizabeth St., Chicago
Zadel, Frank, Witt

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